Alliance for IoT and Edge Computing Innovation

White Paper
A Replicability and Scalability Assessment tool
Release 1.0

AIOTI FG Innovation Ecosystems
Replicability and scalability Assessment Task Force

1 June 2023

1. Executive Summary

The Replicability and Scalability initiative has the objective to facilitate the reusage of IoT and Edge computing use cases and solutions developed in European funded research projects. A number of projects are developing and experimenting use cases and solutions that could be advantageously replicated in other locations in order to avoid "reinventing the wheel syndrome".

For that purpose, the AIOTI Task Force Replicability and Sustainability developed an assessment tool able to qualify each use case/solution in terms of replicability level in order to give relevant information to developers that are willing to replicate them.

This white paper is proposing a methodology as well as a tool (questionnaire) that allow an accurate study of use case/solution. It covers 5 dimensions that need to be addressed to qualify a result and it has been developed in cooperation with the Horizon Result Platform and the Horizon Result Booster projects with the objective to use it in other domains than IoT and Edge Computing.

A questionnaire has been developed based on the topics identified for each dimension, this questionnaire will be used to define the replicability level of a specific solution. For each question a number of points is allocated and the level will be defined according to a minimum number of points. Three levels have been pre-defined (High replicability, Medium replicability and Low replicability). They will be adjusted after running a specific pilot which will help to identify the relevant thresholds.

A pilot will be conducted with the Smart Network and Services call 1 projects which are ready to collaborate in order to get an idea of the replicability of the development planned in their respective projects.

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1. Scope of the AIOTI Replicability and Scalability Task Force

"The EU aims to create more connected and efficient innovation ecosystems to support the scaling of companies, encourage innovation and stimulate cooperation among national, regional and local innovation actors". European Innovation Ecosystems

Replicability and Scalability are two very important aspects to enable the uptake of R&I project results and bring them to the market.

1. **Provide criteria and guidelines** to be taken into consideration when we talk about Replicability and Scalability in an EU R&I Project, starting from LSPs (especially in IoT domain and 5GPPP Pilot projects) experiences

2. **Provide a "Replicability and Scalability Assessment Tool"** to increase project efficiency and maximise the impact of project results, in line with the EU Commission expectations

3. Facilitate the emergence of the **Innovation Ecosystems in EU and their interconnection**

1.1 Definitions of Replicability, Scalability and Sustainability

Replicability

Replicability refers to the ability of your product, service or business to be replicated, sold and delivered consistently and reliably, to serve (theoretically) infinite customers (multiple markets) the exact same service or product, to the exact same standard every time.

KEYWORDS
1. Replication
2. Consistence
3. Reliability
4. Multiple markets
5. Quality standards of the product

Scalability

A result, or rather the business exploiting the result, can be considered scalable if it is able to adapt to the changing needs or patterns of its customers/users and to the increased market demand, trends, and needs, even in the face of competition, while remaining profitable and keeping high quality standards. Factors such as the flexibility of technology design, resilience of the supply chain and logistics, the organizational structure of the company and the efficiency of its operations affect scalability.

For investors, scaling is about increasing revenue generated by one unit of resources, or simply put, doing more with less. It is about making the business more efficient and improving its unit economics over time.

Growing, instead, is about acquiring and allocating resources. It is about raising funding and using the funds to recruit sales people or expanding to other geographies. It means adding more fuel to the rocket for it to go farther.

KEYWORDS
- User/stakeholders needs
- Competitors analysis
- Market needs
- Organizational structure of the company (the team)
- Investors
- Financials

Sustainability

"A business model for sustainability helps describing, analysing, managing, and communicating (i) a company's sustainable value proposition to its customers, and all other stakeholders, (ii) how it creates and delivers this value, (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries."[1]

In simple terms, a sustainable resilient business model focuses on adding value to stakeholders, to the environment and to the society.

KEYWORDS
- Business models for sustainability
- Sustainable value proposition
- Environment, Economy and Society

The sustainability covers three main complementary aspects:

1. Business sustainability as described above
2. Technical sustainability which addresses the maintainability (Q7 in the technology dimension)
3. Environmental sustainability which is described in section 5.7

[1] https://sustainablebusinessmodel.org/

2. The process and the methodology

We can identify three main steps to reach the goals mentioned in Section 1:

1. **Assessment**. Replicability and Scalability of Assets/Key Exploitable Results (KERs) should be assessed during the project lifetime, against several dimensions, that represent key enablers of the replicability and scalability process: i) technical ii) market (market analysis, business model definition, etc), iii) user/stakeholder (user needs analysis, user experience design and usability of solutions, clear instructions on how to use and replicate the solution, etc…) iv) data dimension (GDPR compliance, data security and data quality, etc…), v) IPR, vi) regulatory framework compliance.

2. Define **actions**, aimed to foster replicability and scalability of results. Among others, we can mention: i) Early adopters' involvement through experimentation ii) Clustering activities, iii) Open Calls, iv) Local ecosystem involvement v) Scientific publication vi) public presentation vii) networking events

3. Use **Platforms** that can support and improve the successful replication of a project results. Platforms, such as IoT Catalogue, Horizon Results Platform, NG IoT, Catalogue NGI.EU, etc…

Replicability and Scalability process will support the IoT and Edge computing ecosystem(s) considering three main pillars:

1. The IoT & Edge computing Sector (with specific assessment and considerations)

2. The cross-cutting role of IoT & Edge computing innovation

3. The way innovation is linked to the evolution of other sectors in the economy

One of the main challenges of innovation ecosystems creation is to align stakeholders around a common vision, that could be different and wider than the sectoral one (ref Ecosystems and Community Canvas). In our idea, each stakeholder should be involved in one or more steps of the R&S process, according to its role and synergies with other stakeholders, that will maximise the benefits each actor can expect from this process.

SCoDIHNet members (DIHs) should become ambassadors of the replicability initiative as they will be very interested to reuse existing use cases and solutions to develop innovations at local level. The assessment tool as defined above will be very helpful as it will facilitate the identification of existing use cases/solutions that fit their customer and market needs and that could be adapted to develop innovations.

3. Synergies with other Initiatives

Below are listed possible cooperations that can be put in place with other complementary initiatives:

- **Supporting Ecosystem Engagement for Sustainable Innovation empowered by IoT and Edge Computing** (White Paper) → Eric Armengaud, Jara Pascual
- **SCoDIHNet** → Pierre Yves Danet
- **OPEN DEI** → Sergio Gusmeroli, Gabriella Monteleone
- **Collabwith** → Jara Pascual
- **Horizon Result Platform** → Georgios Lyssandrides (HRP Team Leader)
- **Horizon Result Booster** → Alessia Melasecche Germini
- **ASSIST-IOT project** → Ignacio Lacalle Ubeda

The objective of these cooperations is to validate the tool with real replication pilots (DIHs) and to check the possibility to use it in other domains (AI, big data, HPC, cybersecurity, …). With regard to the Horizon Result Platform and Booster, the objective is to use this methodology in this context as they have also identified the replicability as a specific category of project results.

4. Synergies with other AIOTI Working Groups and initiatives

Below are listed possible cooperations we can be put in place with other related AIOTI groups:

- **TF Digital for Climate TF** → Sustainability
- **WG Standardisation WG** → Sustainability
- **WG Testbeds** → could take advantage of the tool for development using testbeds
- **WG Manufacturing** → Use cases and replicable solutions
- **WG Agriculture** → Use cases and replicable solutions

5. Assessment

This chapter describes of the main actions of this step of the Process and defines the Assessment Dimensions.

In the following sections, the term components is used, it represents a sub-part of a solution but it could happen that one solution is made with only one component.

5. Technology

This assessment dimension would determine if a project result/solution is replicable or scalable from a technical point of view.

For this reason, the following sub-dimensions have been identified:

1. **Openness of components**

Component provides interfaces that could allow easy integration in other environments

Easy to integrate in another environment

Difficult to integrate in another environment without expert support

Impossible to integrate in another environment

2. **Interoperability of components**

Standardized device communication API

Provides application developers with uniform and transparent access to physical devices and wearables. (e.g. SCRAL, LinkSmart)

Standardized API available

No API available

3. **Standardized Data Modeling**

Allows IoT syntactic and semantic interoperability (e.g. OGC SensorThings API),

Standardized Data model available

Standardized Data Model

Proprietary Data Model

4. **IoT Platform interoperability**

Allows the integration with other IoT platforms (e.g. oneM2M, FIWARE, Azzure, …, see SCoDIHNet platform catalogue)

Component is running on one of the IoT platforms

Component is running on a proprietary platform

5. Modularity

Referred to modular IoT architecture that can be customized for a diverse range of applications or, in general, to a design principle that subdivides a system into smaller parts called modules, which can be independently created, modified, replaced, or exchanged with other modules or between different systems

Component has been designed with several modules

Component has been designed in one single module

6. Compatibility with legacy infrastructure and equipment

The solution is using legacy network infrastructure (5G, Sigfox, Lora, NB-IoT, …) and devices

The solution is using legacy infrastructure

The solution is using proprietary infrastructure

The solution is using legacy devices

The solution is using proprietary devices

7. Updates and Maintenance

Components should evolve to add new functionalities or to correct bugs, this could be made could be easily remotely or need intervention of experts

Component updated and maintained by the integrator (DIH)

Maintenance and updates need expert intervention

8. Standards Compliance

Many standards have been developed for IoT and communication, interoperability could only become a reality if components are compliant to one or the other standards

Component compliant to a standard

Component not compliant to any standard

9. Communication/Cloud infrastructure

Data generated by IoT need to be stored and manipulated before feeding the end user application. This topic targets the communication protocol used to send out data to the cloud data centre. There are several types of protocol available (Sigfox, LoRa, 4G, 5G, RF, NFC, …) which need to offer interoperability.

Component compliant with a communication protocol standard

Component use a proprietary communication protocol

10. Exploitation potential/applicability to industrial relevant environment

In order to contribute to the Digitalisation of the European Industry (Digital Europe Program) through the Digital Innovation Hubs, a component should be used for use cases addressing industry whatever it is.

Component able to be used in an industrial environment

Component not usable in an industrial environment

11. Technology Readiness Level

Technology readiness levels (**TRLs**) are a method for estimating the maturity of technologies during the acquisition phase of a program.

TRL1: Basic principles observed

TRL2: Technology concept formulated

TRL3: Experimental proof of concept

TRL4: Technology validated in lab

TRL5: Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)

TRL6: Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)

TRL7: System prototype demonstration in operational environment

TRL8: System complete and qualified

TRL9: Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Technology Readiness Level Calculator was developed by the United States Air Force.[6] This tool is a standard set of questions implemented in Microsoft Excel that produces a graphical display of the TRLs achieved. This tool is intended to provide a snapshot of technology maturity at a given point in time

5.2 Data

This assessment dimension would determine if a project result/solution is replicable or scalable from a "Data" point of view

1. **Compatibility with data privacy rules**

   Data provided by IoT and used by applications should be under the European regulation. IoT are providing basic information but also videos, pictures or human sensors data that fall under GDPR

   Component is not collecting personal data

   Component is collecting personal data but respects the GDPR

2. **Data Modelling**

   Data modelling is the process of creating a visual representation of either a whole information system or parts of it to communicate connections between data points and structures. Data modelling employs standardized schemas and formal techniques. This provides a common, consistent, and predictable way of defining and managing data resources across an organization, or even beyond. A number of tools are available to support the methodology (Erwin Data Modeller, Enterprise Architect, ER/Studio, Open ModelSphere, …)

   A data modelling tool has been used

   No data modelling tool has been used

3. **Data security**

   Data security is the practice of protecting digital information from unauthorized access, corruption, or theft throughout its entire lifecycle. It encompasses Encryption, Data erasure, Data masking and data resiliency

   Component is implementing Data encryption

   Component is implementing Data erasure

   Component is implementing Data masking

   Component is implementing Data resilience

4. **Data quality**

   Data quality measures the condition of data, relying on factors such as how useful it is to the specific purpose, completeness, accuracy, timeliness (e.g., is it up to date?), consistency, validity, and uniqueness.

   Component is implementing Data completeness control

   Component is implementing Data accuracy control

   Component is implementing Data timeliness control

   Component is implementing Data consistency control

   Component is implementing Data validity control

   Component is implementing Data uniqueness control

5. Data assets management

Data Assets Management (DAM) has the objective to Acquiring, monitoring, using, optimizing, and exploiting data assets to generate value. DAM encompasses Accessibility, compliance and Risk management.

Component is providing Data asset catalogue

Component is compliant with all relevant regulation

Component is implementing the relevant security strategy

6. Data relevance

Data relevance is a measure of the impact of specific data on decisions or actions by the user. Collecting irrelevant data contributes to information "overload" and complicates decision-making.

Component is able to select relevant data

Component is only using specific collected data

5.3 Market

This assessment dimension would determine if a project result/solution is replicable or scalable from a business point of view. We can refer to the Business Readiness level methodology (https://businessreadinesslevels.wordpress.com/what-are-the-business-readiness-levels/) That is offering a way to address the marketing steps that needs to be studied.

1. **Market analysis**

   A market analysis provides information about industries, customers, competitors, and other market variables. You can also determine the relationship between supply and demand for a specific product or service. Based on these insights, you can make more informed decisions about possible marketing strategies.

   A market analysis has been conducted

   No market analysis conducted yet

2. **Customer demand analysis**

   Customer demand analysis is research done to estimate or find out the customer demand for a product or service in a particular market. Customer demand analysis process needs to be done in a structured manner for a particular market and affects the business strategy and decisions. Some of the steps which are to be followed for the analysing the demand are: Market selection, Product/service category analysis, understanding business parameters, understanding the competitors and partner trends

   A Customer demand analysis has been conducted

   No Customer demand analysis conducted yet

3. **Business Model**

   The term business model refers to a company's plan for making a profit. It identifies the products or services the business plans to sell, its identified target market, and any anticipated expenses. There are a number of Business models but for a manufacturer which is responsible for sourcing raw materials and producing finished products by leveraging internal labour, machinery, and equipment. A manufacturer may make custom goods or highly replicated, mass-produced products. A manufacturer can also sell goods to distributors, retailers, or directly to customers.

   A Business model has been developed

   No Business model available yet

4. **Stakeholder needs analysis**

   A stakeholder analysis is a project management tool used to identify the project's stakeholders, issues they care about and how they will be impacted by the project. Creating a stakeholder analysis will outline the essential people you need to communicate with about the progress and scope of the project, the topics you need to keep them informed about as the project progresses and how often you should speak to each stakeholder

   A Stakeholder needs analysis has been conducted

   No Stakeholder needs analysis conducted yet

5. IPR analysis

Intellectual property (IP) rights aim to stimulate innovation by enabling inventors to appropriate the returns on their investments. IP also plays an important role in the creation, dissemination and use of new knowledge for further innovation, as contained in the inventions disclosed in patent documents. In the replicability context, it is important to check that the solutions developed is not using licensing enablers or at least to have identified them.

A IPR analysis has been conducted

No IPR analysis conducted yet

6. IP strategy for your solution

An IP strategy is a plan for you to develop, grow, leverage and monetize your portfolio of IP assets (e.g., patents, copyrights, trademarks, trade secrets, design and data). The goal is to give you a competitive advantage in the market, as well as to drive your revenues and profitability.

An IP strategy has been defined

An IP strategy is in place

There is no specific IP strategy defined yet

7. Solution validated in the market

Market validation includes reviewing your solution with your market (customers and prospects). This type of validation is important to fully understand your solution until they see or experience it first-hand. This enables you to ensure that your product resonates with your market.

Your solution is deployed at (prospect) customer site

Your solution is generating revenues

Your solution has not been deployed at customer site

8. Market Readiness level

Market Readiness Level refers to how ready your product or service is to take to market as a commercial offering for a group of customers. It defines 9 levels which are the following ones (https://businessreadinesslevels.wordpress.com/what-are-the-business-readiness-levels/):

BRL1: Concept

BRL2: Problem-Solution fit

BRL3: Build Team and Plan

BRL4: Customer definition

BRL5: Hypothesis testing

BRL6: Minimum viable product

BRL7: Feedback

BRL8: Scale

BRL9: Fully Embedded Business

The BRL scale adopts a market perspective on innovation by estimating the project team's ability to steer the innovation (from idea to product) for the best market fit. Technological and market maturity are measured on scales of 1 to 9, to be worked on jointly to reconcile Technology and Market concerns.

5.4 Acceptance

Product acceptance is the process of ensuring that a product meets all requirements for delivery to the customer. It verifies that a given purchased or manufactured item meets specifications and is usable for its intended purpose.

It is typically conducted during or after development by verifying and validating that the product meets performance criteria and other standards such as safety and usability.

The acceptance involves testing, inspecting, and reviewing the product to ensure it meets all specifications before being released for sale or use. Once a product has been accepted, it can be released to the market, fully deployed onsite, or used in production environments.

1. **End-user interface design/usability**

   User interface design is responsible for a product's appearance, interactivity, usability, behaviour, and overall feel. UI design can determine whether a user has a positive experience with a product.

   A focus group has been conducted

   A user test has been conducted

   A pilot/experiment has been conducted

2. **Implementation instructions and documentation**

   Product documentation is a type of technical documentation that explains almost everything there is to know about a product or piece of software.

   The goal of product documentation is to enable users to get maximum use and value out of the product in question. From there, it can also be used to empower users to engage deeper with your company and strive ever-closer to their goals.

   Product documentation covers a wide spectrum of information, such as:

   - Product specifications and system requirements available
   - Instructions for product setup, installation, and configuration available
   - Specific use case instructions available
   - Troubleshooting info available
   - User documentation and answers to frequently asked questions available

3. **Adoption by DIHs**

   The use case/solution will be well accepted by the DIHs if the component answers to the end user needs, is easy to use, to modify, to maintain and cost effective. One of the main objectives of the Replicability initiative is to use the DIHs to accelerate replication of project use case / solution.

   - The use case / Solution is well-known from DIHs
   - The use case / Solution is unknown from DIHs

4. User experience

User Experience refers to the feeling users experience when using a product, application, system, or service. It is a broad term that can cover anything from how well the user can navigate the product, how easy it is to use, how relevant the content displayed is etc. User experience (UX) testing is the process of testing different aspects of user experience to determine the best way for a solution and its elements to interact with the end users. There are a number of tools available to test UX ((card sorting, Moderated user testing, unmoderated user testing, voice of end users, recordings, …

- UX testing has been conducted
- UX testing has not been conducted yet

5. Language

In European projects, user Interface (UI) are usually designed using the English language. In the case of replicability, it is obvious that the UI has to be adapted to the targeted country (even outside Europe).

- The solution is already supported other languages
- The solution could use other languages
- The solution can't use other languages easily

6. Societal readiness

The Societal Readiness Level (https://innovationsfonden.dk/sites/default/files/2019-03/societal_readiness_levels_-_srl.pdf) is a way of assessing the level of societal adaptation of, for instance, a particular social project, a technology, a product, a process, an intervention, or an innovation (whether social or technical) to be integrated into society. There are 9 levels (SRL) which help to qualify the solution, which one fits the best with your case:

SRL 1 – identifying problem and identifying societal readiness

SRL 2 – formulation of problem, proposed solution(s) and potential impact, expected societal readiness; identifying relevant stakeholders for the project.

SRL 3 – initial testing of proposed solution(s) together with relevant stakeholders

SRL 4 – problem validated through pilot testing in relevant environment to substantiate proposed impact and societal readiness

SRL 5 – proposed solution(s) validated, now by relevant stakeholders in the area

SRL 6 – solution(s) demonstrated in relevant environment and in co-operation with relevant stakeholders to gain initial feedback on potential impact

SRL 7 – refinement of project and/or solution and, if needed, retesting in relevant environment with relevant stakeholders

SRL 8 – proposed solution(s) as well as a plan for societal adaptation complete and qualified

SRL 9 – actual project solution(s) proven in relevant environment

5.5 Regulation/Policy

The European Commission and Member states are elaborating a policy strategy that gives a long-term vision of the evolution of Europe that are translated into laws. It addresses Environment, economy, health, democracy, …).

The European Union is based on the rule of law. This means that every action taken by the EU is founded on treaties that have been approved democratically by its members. EU laws help to achieve the objectives of the EU treaties and put EU policies into practice. There are several EU acts that are applying to European citizens and industries. There are a number of regulations addressing the digital sectors that all products need to respect.

1. **EU regulation compliance**

   Looking to the EUR-Lex tool (https://eur-lex.europa.eu), there are 633 regulations that are application to the digital sector

   Checking the compliance with the European Regulation has been conducted

   No check of the compliance with the European Regulation has been conducted

2. **National regulation Compliance**

   At national level there are also specific laws that are not against European legislation but that could bring additional constraints.

   Checking the compliance with the National Regulation has been conducted

   In that case, which countries has been investigated:

   No check of the compliance with the National Regulation has been conducted

3. **EU Policy support**

   The political strategy of this Commission is to set Europe on a path to successfully achieving climate neutrality by 2050, shaping our digital future, strengthening our unique social market economy, building a Union of prosperity, and making Europe stronger in the world. 6 priorities have been identified, when one your solutions to contributing to:

   A European Green Deal

   A Europe fit for the digital age

   An economy that works for people

   A stronger Europe in the world

   Promoting our European way of life

   A new push for European democracy

6. Complementary Replicability topics

This section recaps other related information that could help to polish the replicability level of a solution.

6.1 Ecosystem

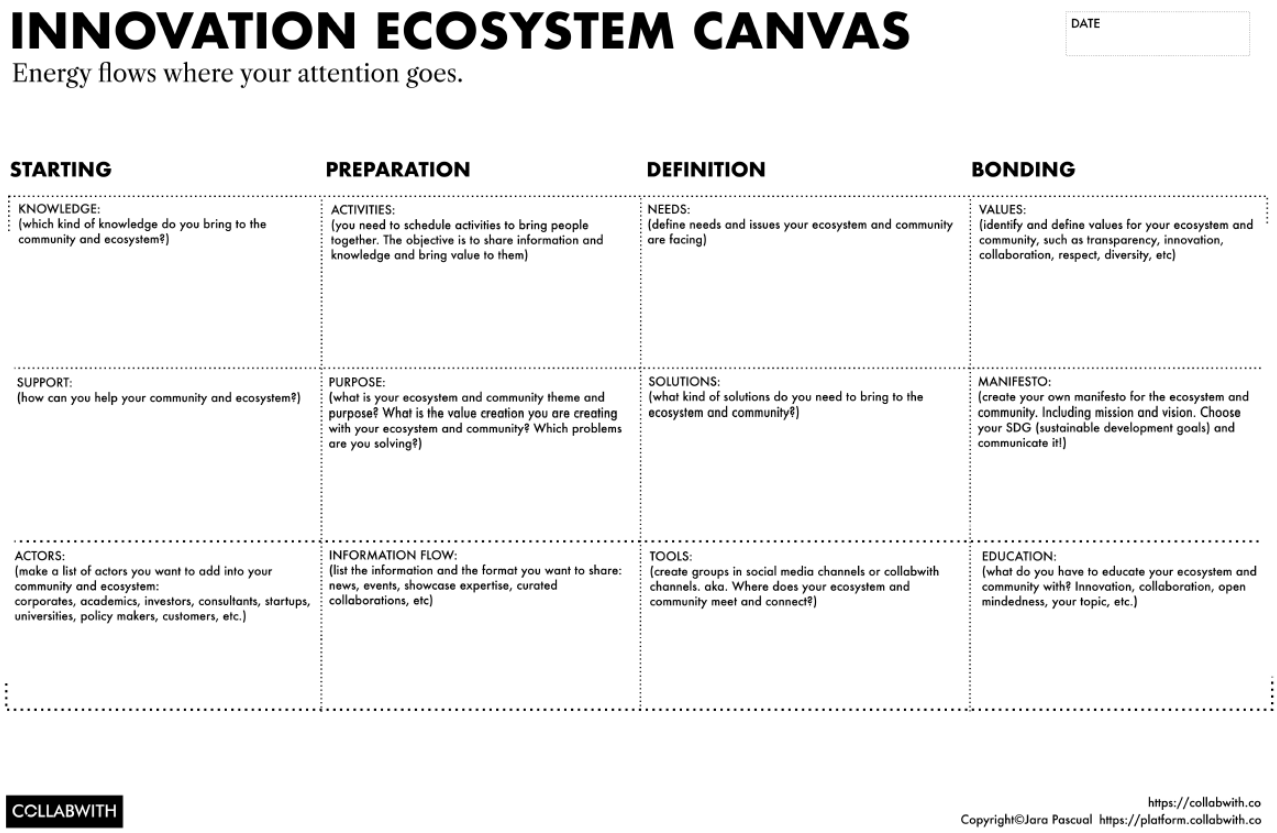
Collabwith has developed an innovation Ecosystem Canvas that describes a methodology to facilitate the development of innovations. There are a number of stakeholders that need to collaborate to ensure a successful solution.

In the context of Replicability and Scalability, the innovation ecosystem is key as you need around the table the end user, the integrator (DIHs), the technology provider and many others even they are not located in the same area.

Replicability is part of the innovation journey and is key to facilitate the business take off. A number of projects develop and experiment innovative solutions that most often stay in the labs after the end of the project. Replicability is willing to take advantage of these results to bring them to the market and for that purpose there is a need to establish collaboration among the stakeholders.

The methodology developed by Collabwith is a way to facilitate the development the relevant ecosystem for a specific use case/olution. There is a need to structure the ecosystem, find the stakeholders, involve them, co-create with them, put in place a win-win situation where everyone could find an interest.

When such ecosystem is put in place, replication is easier and could be sustainable for a number of replications.



INNOVATION ECOSYSTEM CANVAS

Energy flows where your attention goes.

DATE

STARTING	PREPARATION	DEFINITION	BONDING
KNOWLEDGE: (which kind of knowledge do you bring to the community and ecosystem?)	ACTIVITIES: (you need to schedule activities to bring people together. The objective is to share information and knowledge and bring value to them)	NEEDS: (define needs and issues your ecosystem and community are facing)	VALUES: (identify and define values for your ecosystem and community, such as transparency, innovation, collaboration, respect, diversity, etc)
SUPPORT: (how can you help your community and ecosystem?)	PURPOSE: (what is your ecosystem and community theme and purpose? What is the value creation you are creating with your ecosystem and community? Which problems are you solving?)	SOLUTIONS: (what kind of solutions do you need to bring to the ecosystem and community?)	MANIFESTO: (create your own manifesto for the ecosystem and community. Including mission and vision. Choose your SDG (sustainable development goals) and communicate it!)
ACTORS: (make a list of actors you want to add into your community and ecosystem: corporates, academics, investors, consultants, startups, universities, policy makers, customers, etc.)	INFORMATION FLOW: (list the information and the format you want to share: news, events, showcase expertise, curated collaborations, etc)	TOOLS: (create groups in social media channels or collabwith channels. aka. Where does your ecosystem and community meet and connect?)	EDUCATION: (what do you have to educate your ecosystem and community with? Innovation, collaboration, open mindedness, your topic, etc.)

COLLABWITH

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6.2 Sustainability

Horizon Europe is the European Union's research and innovation funding program for the period of 2021-2027. The program is designed to promote scientific excellence and address societal challenges, including the transition to a more sustainable and green economy. To demonstrate contribution to the EU Green Deal in Horizon Europe research projects, the following requirements should be met:

1. **Alignment with the EU Green Deal**: The research project should be aligned with the objectives of the EU Green Deal, which aims to make Europe climate-neutral by 2050. The project should contribute to the goals of the EU Green Deal, such as reducing greenhouse gas emissions, promoting sustainable agriculture and forestry, and protecting biodiversity.

2. **Integration of green principles**: The project should integrate green principles into its design, implementation, and dissemination. This could include the use of environmentally friendly technologies, reducing waste and energy consumption, and promoting sustainable practices in all aspects of the project.

3. **Environmental impact assessment**: The project should conduct an environmental impact assessment to evaluate its potential environmental impact and identify measures to mitigate any negative impacts. This should be done at the outset of the project and reviewed regularly throughout its implementation.

4. **Open access to data**: The project should ensure open access to data, as well as share knowledge and results with other researchers and stakeholders. This promotes transparency and allows for wider dissemination of information, which can help promote sustainable practices.

5. **Involvement of stakeholders**: The project should involve stakeholders, including industry, civil society, and policymakers, to ensure that its outcomes are relevant, impactful, and aligned with societal needs. Stakeholder engagement can also help identify barriers and implement sustainable practices and potential solutions to overcome them.

This assessment dimension would determine in which measure the project contributed to achieving the EU Green Deal objectives and overall sustainability.

6.3 Financial

This assessment dimension would determine if a project result/solution is replicable or scalable from the following financial aspects:

- Regional funds
- EU projects Cascade funding
- EU projects Open Calls

7. The Replicability Assessment tool

A questionnaire to evaluate Replicability and Scalability readiness level (Focus on IoT and Edge computing) has been developed in order to collect the answers of the above dimensions it will help to qualify the replicability level of a specific solution.

Questionnaire can be found **here**.

For each question a point allocation has been defined and a total of points will be calculated when the questionnaire is completely filled in.

Following the pilot, we shall define the minimum number of points that a solution should reach to be replicable and in a further step we are planning to define several levels of replicability that could bring to the integrator a degree of confidence to one or the other solution available in the replicability catalogue.

However, for the pilot phase, the following figures will be used(LR=Level of Replicability).

High level of replicability :	61 < LR < 80
Good level of replicability:	31 < LR < 60
Low level of replicability:	00 < LR < 30

Technical dimension	Points
T1: Openness of components	0
T2: Interoperability of components	0
T3: Standardized Data Modelling	0
T4: IoT Platform Interoperability	0
T5: Modularity	0
T6: Compatibility with legacy infrastructure and equipment	0
T7: Updates&Maintenance	0
T8: Standrds compliance	0
T9: Communication/Cloud infrastructure	0
T10: Exploitation potential	0
T11: Technical Readiness Level	0
Data dimension	**Points**
D1: Compatibility with data privacy rules	0
D2: Data Modelling	0
D3: Data Security	0
D4: Data Quality	0
D5: Data Asset Management	0
D6: Data Relevance	0
Market dimension	**Points**
M1: Market Analysis	0
M2: Demand Analysis	0
M3: Business model	0
M4: Stakeholder needs Analysis	0
M5: IPR Analysis	0
M6: IP strategy for your solution	0
M7: Solution validated in the market	0
M8: Business Readiness Level	0
Acceptance dimension	**Points**
A1: End-user interface design/usability	0
A2: Implementation instructions and documentation	0
A3: Adoption by DIHs	0
A4: User experience	0
A5: Language	0
A6: Societal Readiness Level	0
Regulation/Policy dimension	**Points**
R1: EU Regulation Compliance	0
R2: National Regulation Compliance	0
R3: EU Policy support	0

8. Action Plans

In this section, a work plan is proposed to validated the assessment tool and to accelerate the replicability

- Paper publication and dissemination (webinar -27 June) including EC partners (Horizon Result Platform and Booster)
- Development of a questionnaire and make a presentation at the webinar
- Identification of AIOTI members interested to experiment the assessment tool with their solutions
- Organisation of a real pilot with one SCoDIHNet DIH
- Feedback analysis and follow-up strategy (i.e. AIOTI label,)

9. Platforms and Catalogues

In this section we will provide an overview of platforms and catalogues that can help to foster replicability and scalability of R&I Results.

- AIOTI Testbeds Portfolio: https://aioti.eu/about-us/our-groups/testbeds/
- Horizon Results Platforms: https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform
- Next Generation IoT open-source projects: https://www.ngiot.eu/archive-for-open-source-projects
- Catalogue NGI.EU: https://www.ngi.eu/discover-ngi-solutions/
- SCoDIHNet Catalogues:
    - SCoDIHNet platform catalogue: List of platforms use by DIHs
    - SCoDIHNet replicability catalogue: List of use cases & available solutions

Definitions and Abbreviations

A component is a technology piece of a solution

A Solution is a stand-alone feature able to support uses cases

A Project result is a tested solution on at least one use case (KER)

API	Application Protocol Interface
DIH	Digital Innovation Hub
DAM	Data Assessment Management
GDPR	General Data Protection Regulation
IoT	Internet Of Things
IP	Intellectual Property
IPR	Intellectual Property Rights
KER	Key Exploitable Results
NGI	Next Generation Internet
OGC	Open Geospatial Consortium
R&I	Research and Innovation
SCoDIHNet	Smart Connectivity DIH Network
SCRAL	Smart City Resource Adaptation Layer
UI	User Interface
UX	User eXperience

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About AIOTI

AIOTI is the multi-stakeholder platform for stimulating IoT Innovation in Europe, bringing together small and large companies, start-ups and scale-ups, academia, policy makers and end-users and representatives of society in an end-to-end approach. We work with partners in a global context. We strive to leverage, share and promote best practices in the IoT ecosystems, be a one-stop point of information on all relevant aspects of IoT Innovation to its members while proactively addressing key issues and roadblocks for economic growth, acceptance and adoption of IoT Innovation in society.

AIOTI's contribution goes beyond technology and addresses horizontal elements across application domains, such as matchmaking and stimulating cooperation in IoT ecosystems, creating joint research roadmaps, driving convergence of standards and interoperability and defining policies. We also put them in practice in vertical application domains with societal and economic relevance.