D4.2 DIH CAPABILITY MATURITY MODEL.V2

WP 4 - DIH Capacity Building and Monitoring

Second Version – M23 – 28 September 2020

Managing Maturity of the Digital Innovation Hub Innovation Services

Update on the SmartAgriHubs Innovation Services Maturity Model and Assessment instrument

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement № 818182

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1. LIST OF ABBREVIATIONS

Abbreviation	Explanation
CC	Competence Centre
DIH	Digital Innovation Hub
FIE	Flagship Innovation Experiment
IPR	Intellectual Property Right
IE	Innovation Experiment
ISSM	Innovation Services Maturity Model
RDI	Research, development and innovation
RTO	Research and Technology Organisation
SAH	SmartAgriHubs
SME	Small and Medium Enterprise
TRL	Technology Readiness Level
VC	Venture Capitalist
WP	Work Package

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PROJECT SUMMARY

Digital technologies enable a transformation into data-driven, intelligent, agile and autonomous farm operations, and are generally considered as a key to address the grand challenges for agriculture. Recent initiatives showed the eagerness of the sector to seize the opportunities offered by ICT and data-oriented technologies. However, current available applications are still fragmented and mainly used by a small group of early adopters. Against this background, SmartAgriHubs (SAH) has the potential to be a real game changer in the adoption of digital solutions by the farming sector.

SAH will leverage, strengthen and connect local DIHs and numerous Competence Centres (CCs) throughout Europe. The project already put together a large initial network of 140 DIHs by building on its existing projects and ecosystems such as Internet of Food and Farm (IoF2020). All DIHs are aligned with 9 regional clusters, which are led by organizations that are closely related to national or regional digitization initiatives and funds. DIHs will be empowered and supported in their development, to be able to carry out high-performance Innovation Experiments (IEs). SAH already identified 28 Flagship Innovation Experiments (FIEs), which are examples of outstanding, innovative and successful IEs, where ideas, concepts and prototypes are further developed and introduced into the market.

SAH uses a multi-actor approach based on a vast network of start-ups, SMEs, business and service providers, technology experts and end-users. End-users from the agri-food sector are at the heart of the project and the driving force of the digital transformation.

Led by the Wageningen University and Research (WUR), SAH consists of a pan-European consortium of over 160 Partners representing all EU Member States. SAH is part of Horizon2020 and is supported by the European Commission with a budget of €20 million.

EXECUTIVE SUMMARY

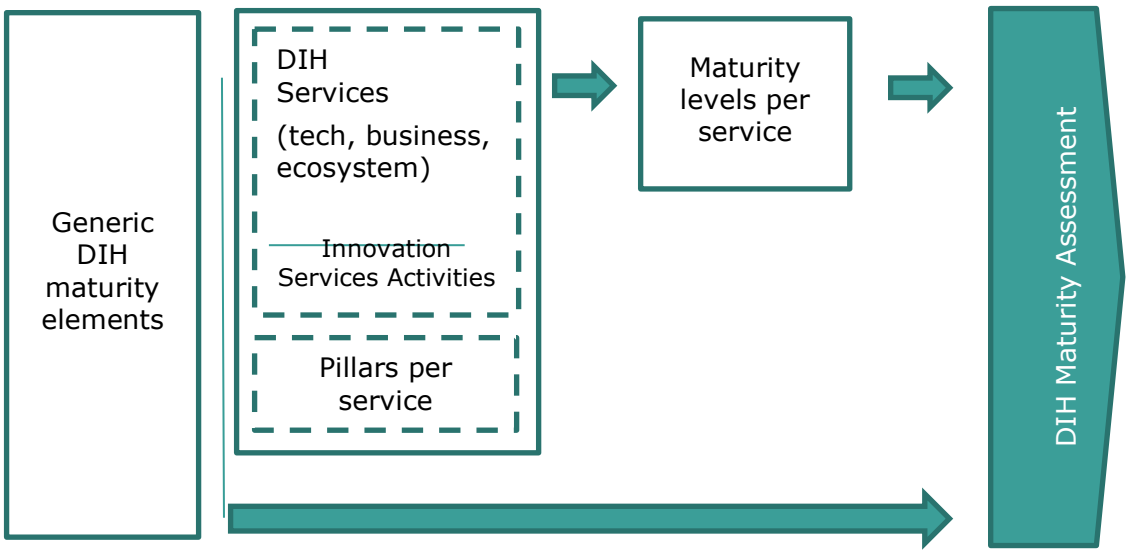
Work package 4 DIH Capacity Building and Monitoring of the SmartAgriHubs project aims to grow the capacities of participating Digital Innovation Hubs (DIHs), empowering them to deliver adequate innovation services in a one-stop-shop (window) approach for delivering genuinely impactful digital innovations. In the end, DIHs should run their "shop" as a self-sustaining business.

The purpose of the Innovation Services Maturity Model and consequent assessment tool is to:

- Facilitate DIHs to self-assess their maturity in relation to the services they provide;
- Help DIHs to identify areas of attention and improvement;
- Provide the SmartAgriHubs project (WP4) with a clear picture of DIHs current status (in terms of services and overall maturity);
- Help the SmartAgriHubs project (WP4) to provide targeted support and guidance to DIHs in order to substantially advance the maturity of the offered services (which is the core of D4.4 and D4.5, resp. Capacity building package of materials for the establishment of a Hub and Capacity building package of materials for operating a Hub);
- Facilitate the SmartAgriHubs project (WP4) to monitor the advancement of the DIHs maturity level with an as objective as possible manner;
- Enable the SmartAgriHubs project (WP4) to use benchmarking in order to make direct comparisons between different DIHs;
- Allow the community of DIHs to structure and share knowledge more efficiently.

It is assumed that when a DIH can do a regular check of its own maturity, it can mature in a substantiated and focused way.

An overview of the different elements of the Maturity Assessment is presented in the Figure below. Each of the elements and their purpose has been described in detail in the deliverable.



Further elaborated on in Chapter 3

This document outlines the approach towards assessing Digital Innovation Hub (DIH) maturity and their services portfolio, and how it is derived. In this 2nd version its design and implementation as a web tool are presented.

1. INTRODUCTION

1.1 DOCUMENT BACKGROUND

This document outlines the approach towards assessing Digital Innovation Hub (DIH) maturity and their services portfolio, which constitutes the second phase of Work Package 4 (Capacity building and monitoring). The maturity assessment serves to support DIHs in their trajectory towards further professionalisation.

Following from SmartAgriHubs Task and Deliverable 4.1 Needs Assessment (Anda, 2019), which assessed the European-wide needs of the sector to become more digitalised, and the current position of Digital Innovation Hubs therein, this deliverable describes how the hubs can assess themselves in order to guide their development towards fully meeting the sector's needs.

Supporting DIHs in this process is a focal point of the SmartAgriHubs project, which is why the topic is related to other Work packages, too: the Maturity Assessment Tool itself will be made available on the Innovation Portal (WP1 DIH Ecosystem Building) along with materials, fora and trainings; funding mechanisms are aimed to match growth needs for sustainable development of DIHs which links to WP2 (Network Expansion by Open Calls); and the Innovation Experiments are an important means to improve and develop DIH services there is also a link to WP3 (Monitoring & Evaluation of Innovation Experiments).

1.2 INNOVATION SERVICES MATURITY

Although the ecosystem of agri-DIHs in Europe is expanding and full of life, most DIHs are yet to fully solidify their contribution to digital transformation of the sector. Most DIHs have actually only just started, and/or are focused on a subset of contributions to transformation such as technology, and not yet on other crucial aspects such as, for instance, end-user adoption (source: D4.1 Needs Assessment). These contributions we call "innovation services" (the services are explained in section 3.1).

WP4 (DIH Capacity Building and Monitoring) of the SmartAgriHubs project aims to grow the capacities of participating hubs in order to deliver adequate innovation services in a one-stop-shop (window) approach for delivering genuinely impactful digital innovations. In the end, DIHs should run their "shop" as a self-sustaining business.

It is assumed that when a DIH can do a regular check of its own maturity, it can mature in a substantiated way. Also, when the SAH-project provides an understandable and user-friendly way of assessing maturity per service, DIHs are expected to identify weaknesses more easily and can adopt a common language to share best practices. And because a standardized and granular way of measuring maturities is developed, it is possible for other stakeholders to get detailed insights in the operation and possible improvements of the hub, too.

Moreover, it provides a means of tracking the progress overall, as one of the goals in the project is to see a quantifiable growth in maturity for 200 of the (ultimately) 400 associated hubs. To this end, anonymised maturity assessments will also be used for aggregated

overviews, e.g. what is the average and spread over maturities of a certain service in a regional cluster (e.g. South-East) or in a sector (e.g. dairy), and for benchmarking.

1.3 ITERATIONS

The model described in this document will be subject to changes; for developing the maturity model we chose a design science approach, in which iterations and validation are essential.

The previous version (September 2019) is the result of the design effort of WP4, which is based on literature, expert opinion and experience.

This version includes an update based on scaled use via implementation in the SmartAgriHubs Innovation Portal. An update of the model was made publicly available on that same portal by May 2020.

The next version will contain further details on the usage of Maturity Model and the 'Friendly Peer Review Mechanism'.

1.4 READING GUIDE: DESCRIPTION OF THE REMAINS OF THE DOCUMENT

The next chapter describes our approach and methodology for realising the alpha and beta version of the Innovation Services Maturity Model (ISSM). Chapter 3 consequently outlines in detail the results of this exercise: the constructs of the model themselves. Chapter 4 presents the implementation of the de maturity model as a webtool in the Innovation Portal. Chapter 5 concludes this document, with suggestions for future activities regarding maturity assessment and the Friendly Peer Review Mechanism.

2. APPROACH & METHODOLOGY

Our approach has resulted in what is called the Innovation Services Maturity Model (ISMM). The process towards creating the alpha version of this model is described in this chapter.

2.1 A DESIGN SCIENCE APPROACH TO THE DIH INNOVATION SERVICES MATURITY MODEL (ISMM)

The DIH Innovation Services Maturity Model (ISMM) can be considered as a tool that transforms information about a hub, entered by hub participants, into maturity levels for that specific hub. These levels, in their turn inform the stakeholders of that hub on the status of each of the innovation services. In fact, this can be seen as a new information system.

For such purposes a design science approach is useful. The philosophy of a design science approach (Hevner, 2004; Peffers, 2006; Sein, 2011) is to combine practical relevance with scientific rigour. Practical relevance means that something is created for use in a practical setting and that it is also evaluated as such. In our case the practical setting is the management of a hub. The scientific rigour refers to the 'rules' and guidelines used for designing and evaluating the created information system. This applies to the theory on which the design is built (there should be something not yet described in scientific literature) and it also applies to how the system is evaluated, e.g. an experiment, and which criteria are used (Peffers, 2012; Prat, 2014). In our case the system builds on existing maturity models (Carroll, 2015; Essmann, 2009; Scheuing, 1989), yet for the DIH innovation services no maturity model exists. So, that is the targeted contribution of our work.

Figure 1 illustrates the phases in Action Design Research (ADR) (Sein., 2011). The 'action' part to design science generally refers to the emphasis on the participation of practitioners and users in the design process.

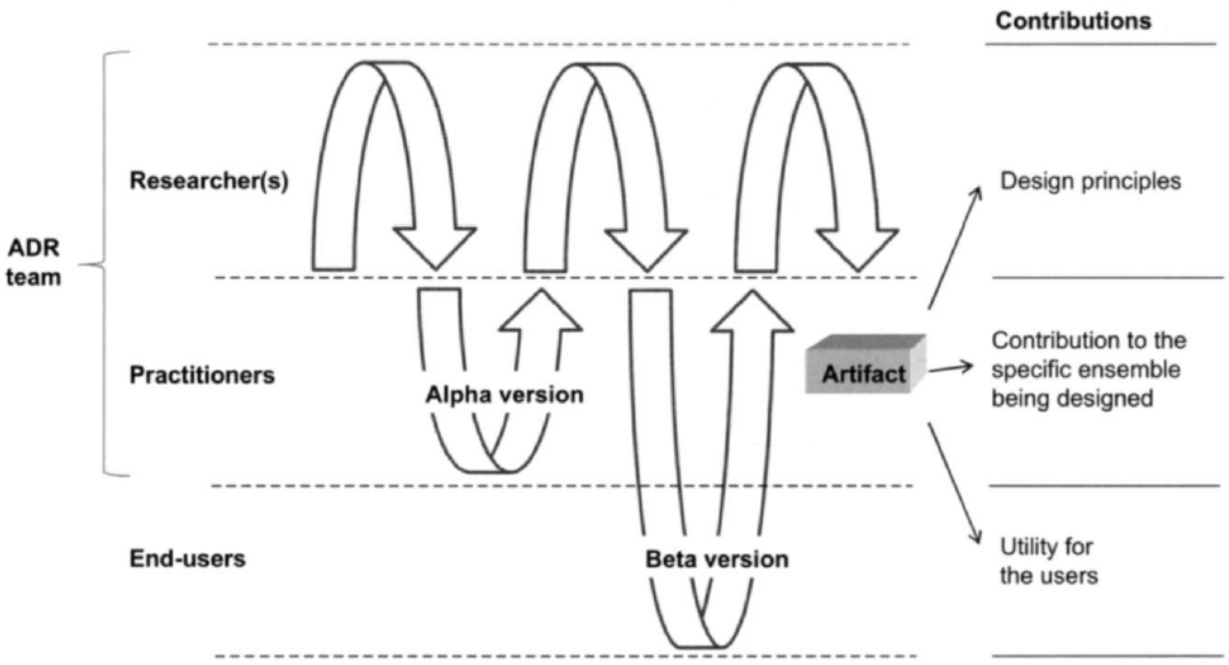


Figure 1: Action Design Research (ADR) iterations over time (Sein et al., 2011)

In our case the design team has ample experience of working with and working in a hub. The subject that is being designed, the maturity model, is referred to as 'artefact'. ADR distinguishes an alpha version of the artefact and a beta version. The alpha artefact is the first design that is being tested, and evaluated, by practitioners. The maturity model reported here can be considered that alpha version.

The beta version is exposed to end users. This refers to the validation in future cycles of the system that is validated with hubs through the SAH Innovation Portal on a larger scale.

(Peffers et al., 2006) distinguish 6 steps in the Design Science Research Process (DSRP). In the following section we will very briefly report how we addressed these.

Problem identification & motivation

The practical problem we are addressing is that, in order to deal with the complexity of the demands of the innovating ecosystem, a Digital Innovation Hub needs structured support with respect to the quality of the services it delivers to its ecosystem. Maturity models (in general) provide such support. In practice and in literature several maturity models are available, yet no maturity model for the identified innovation services exists.

Objectives of a solution

The purpose of the Innovation Services Maturity Model and consequent assessment tool is to:

- Facilitate DIHs to self-assess their maturity in relation to the services they provide;
- Help DIHs to identify areas of attention and improvement;
- Provide the SmartAgriHubs project (WP4) with a clear picture of DIHs current status (in terms of services and overall maturity);
- Help the SmartAgriHubs project (WP4) to provide targeted support and guidance to DIHs in order to substantially advance the maturity of the offered services (which is the core of D4.4 and D4.5, resp. Capacity building package of materials for the establishment of a Hub and Capacity building package of materials for operating a Hub);
- Facilitate the SmartAgriHubs project (WP4) to monitor the advancement of the DIHs maturity level with an as objective as possible manner;
- Enable the SmartAgriHubs project (WP4) to use benchmarking in order to make direct comparisons between different DIHs;
- Allow the community of DIHs to structure and share knowledge more efficiently.

These objectives are based on the perspectives and experiences of the ADR team consisting of researchers and practitioners (WP4 members).

Design & development

The following section (2.2) reports on the development process, its foundations (i.e. review of existing models and experience in other projects) and choices made therein. The alpha version was implemented in MS Excel. The designed (beta) artifact itself is presented in chapter 3.

Demonstration; Evaluation

Section 2.3 details its first trials with three Smart Agri Hubs as end users and its first evaluation results (alpha evaluation) including identified updates to the model. This evaluation focused mostly on understandability and usability and was conducted following two online sessions. One introducing the context and the model, and another discussing the pros and cons of the model. In between the sessions, the end users had and took the opportunity to inspect and work with the model, implemented in MS Excel.

The (updated) design is presented in chapter 3 and can be considered the beta version.

Note that further demonstration and evaluation, by means of an implemented online version in the SmartAgriHubs portal is part of the planned work. See 0 for more details on this.

Communication

This report can be considered the primary communication of the research. For piloting the implementation and for launching the implemented version, we have created a presentation and performed a webinar[1][2]. This is continuously available in the Innovation Portal. Furthermore, additional instructions are documented and available through the Innovation Portal.

2.2 DEVELOPMENT OF THE ALPHA VERSION OF THE MATURITY MODEL

In order to establish the alpha version of the Innovation Services Maturity Model (ISMM) we worked out and elaborated on the main items of General Maturity Elements, Innovation Services and their accompanying Activities, Maturity Levels and Pillars. All items will be explained here at concept level. Chapter 3 will describe them content-wise as they have become part of the alpha ISMM.

Approach: General DIH maturity elements

Firstly, one needs to consider that DIHs are initiatives that ought to operate as an established organisation (irrespective of the legal form). Therefore, some general maturity aspects such as partner management and governance, a financial sustainability model, a clear business plan and support, all need to be taken into account and evaluated. These general aspects do not relate to the specific services, but rather to the organisation/ the overall functioning of the hubs. These aspects also provide a reference for analysing the DIHs maturity; in some organisation forms for instance, certain aspects are logically less present than in others.

Approach: DIH Innovation Services

Digital Innovation Hubs are intermediary, multi-actor organizations that aim to speed up the processes of (digital) technology development, adaptation, transfer and adoption by end-users. Their main beneficiaries are small producers (manufacturing SMEs, small farmers) that experience difficulties in accessing and applying new technologies and innovations. The added value of DIHs is based on their ability to provide useful services to producers, often acting as a one-stop-shop close to their client base.

While these general characteristics provide overall guidelines, stipulating a definition of DIHs is difficult. The concept of DIHs is comparatively new (officially launched in 2016)[3], influenced by the individual national policies and lends itself to be tailored to the regional reality. While DIHs will differ significantly depending on e.g. their priority sector, core technologies or

[1] *https://www.smartagrihubs.eu/login?from=%2Fportal%2Fhome*
[2] *https://www.youtube.com/watch?v=gH2yYsaSm7w&feature=youtu.be*
[3] *https://ec.europa.eu/digital-single-market/en/news/communication-digitising-european-industryreaping-full-benefits-digital-single-market*

region, experience from previous projects indicates that DIHs can be better described based on the services they offer (Butter, 2018, Butter et al forthcoming).

Previous research has identified key activities to be offered by DIHs in support of their digital transformation processes (Butter, 2016/2018). The typical services which a DIH provide can be broadly clustered into three groups (XS2 I4MS, 2018): ecosystem services, technology and adoption services, and business services. (Skills development services, which are also described in the model, can be regarded as a cross-cutting service in support of building capabilities in these three domains). Each of the three groups include a number of services (Figure 2). It is however **crucial that DIHs offer a combination of the three groups of services** -technological services, business development services, ecosystem building services - in order to support SMEs in crossing the so-called valley of death and adopting innovations (Goetheer, 2017). Additionally, as DIHs often address multiple client groups (SMEs, start-up, large companies and even public sector organizations), they often need to provide a wide services portfolio. Naturally, the services offering needs to be matched with the regional needs and demands.

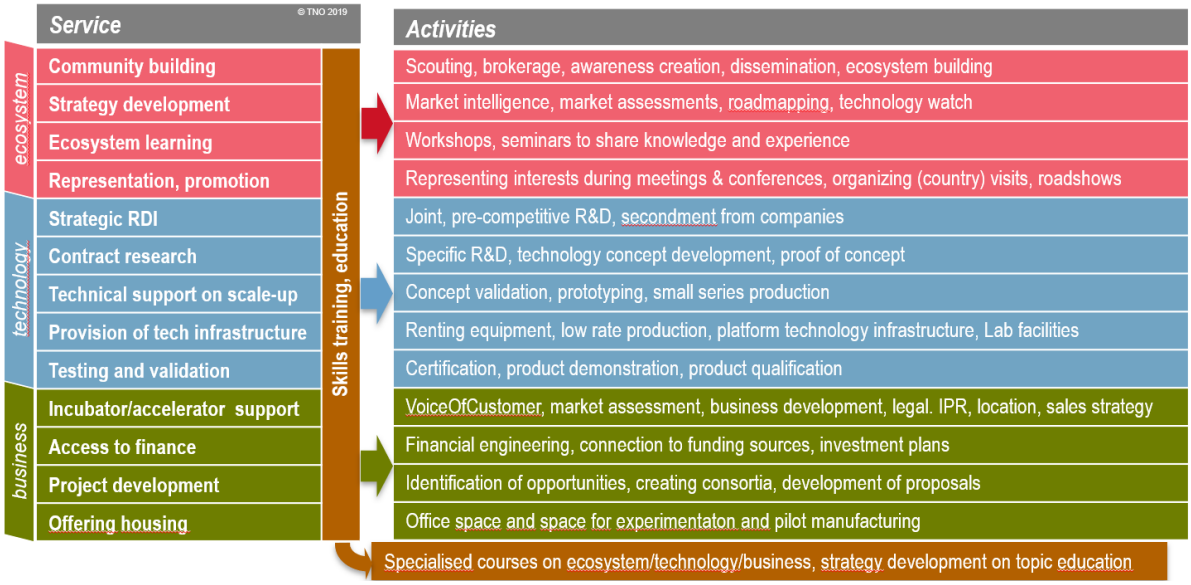


Figure 2: Typical services offered by DIHs (source: Butter, 2018)

Logically following from above, the **Innovation Services Maturity Model** which is developed in the SmartAgriHubs project will be **based on the three groups of services offered by DIHs.** Next to the services, the maturity model will also take into account some general characteristics (such as governance and sustainability of the hub) which are needed to support the effective provision of these services and therefore better meeting the needs of the clients (i.e. farmers). The individual elements and how these are operationalised are described in Chapter 3.

Approach: Innovation Service Activities

Each service is materialized through activities (also in right column Figure 2). These activities make the abstract concept of the service more concrete and outline how a service can actually be delivered in practice.

As mentioned above, these services form the basis (subject) of the DIH maturity assessment. This is seen as an effective approach to allow the evaluation and possible comparison

(benchmarking) among DIHs which often differ in name, composition, organizational form, business model employed, age and tech and sector focus.

Approach: Maturity levels

The foundation of the maturity levels themselves, that the ISMM evolves around and makes actual assessment possible, comes from a variety of sources, including:

- Experiences in other industries;
- The capability maturity framework;
- And a maturity model for innovation capability.

Each of these frameworks served as inspiration for the SAH ISMM and are detailed below.

As the SAH DIH maturity tool is, to the knowledge of the authors, pioneering this sector (agri hubs), the approaches listed below could only provide a general idea of good practices and possible formats. Therefore, these available tools served as inspiration for the SAH ISMM approach. For instance, the DIHNET Champion challenge addresses the services offered and the general hub maturity. This confirmed the approach of basing the SAH ISMM on the services. The ADMA project uses the self-assessment approach of quickly evaluating the overall maturity (in that case for SMEs) per element. Similar idea has been incorporated in the SAH ISMM when it comes to overall evaluation per service (non-pillar specific). Also, the benchmarking capability of ADMA has been incorporated in SAH as a good practice to provide the DIHs to compare themselves with the average performance – a feature that is usually found useful in practice. At the same time, the self-assessment tools for digitization in companies have provided inspiration on focusing on particular topics (such as HR or resource availability) that, when tweaked to the SAH context resulted in the different pillars. Each of the tools has also been analysed in terms of levels of maturity, naming the levels and their description in order to support the formulation of the SAH 5 levels.

Experiences in other industries

Digitisation and Industry 4.0 technologies are often related to their application in the manufacturing sector. There have been a number of projects supporting the digitisation of industry (see for instance the 2016 Digitising European Industry Initiative[4] in which Digital Innovation Hubs are a key element and some of the associated EU projects such as I4MS, SAE, MIDIH, IoF2020, etc). These initiatives have spread across different sectors and technologies (SAH, Photonics- ACTPHAST 4.0[5], the RODIN CSA which addresses robotics for manufacturing, health, and agriculture, etc). Below, some of the maturity/evaluation tools from such projects will be described.

DIHNET and the Champion Challenge for DIHs:[6]

In July 2019, the H2020 DIHNET project, which aims to support a sustainable network of networks of DIHs in Europe, has announced the opening of the project Maturity Prize for champion/mature DIHs. The prize for good practices will be given in two categories: services

[4] *https://ec.europa.eu/digital-single-market/en/pillars-digitising-european-industry-initiative*
[5] *http://www.actphast.eu/*
[6] *https://dihnet.eu/2019/07/launch-of-the-dihs-champions-challenge/*

offered and collaboration strategy for cross-border opportunities. The overall aim of the Champion prize is to:

- "identify good practices of advanced/mature DIHs that others could learn from;
- identify the DIH champions under two categories that focus on collaboration;
- foster future matchmaking opportunities (DIHs finding those with the expertise they need/miss) and
- help fine-tune information in the DIH catalogue on a regular basis."[7]

In order to support the assessment/evaluation of different initiatives, the DIHNET Champion Challenge has developed a questionnaire with quantitative and qualitative questions along 10 different topics: 1 Basic Data; 2. DIH Outcomes; 3. Strategic positioning in regional/national innovation eco-system; 4. Services offered by the DIH to support SMEs; DIH Champions Challenge. Guidelines for Applicants; 5. Collaboration Strategy; 6. Skills development strategy for SMEs; 7. Sustainability mechanisms; 8. Technological Focus; 9. Sectoral Focus; 10. Processing of personal data.

The challenge is open for DIHs from all sectors and technologies but requires participants to be part of the EU JRC (Joint Research Center) catalogue[8].

European Advanced Manufacturing Support Centre (ADMA):[9]

The European Commission has launched the ADMA project in order to establish a European Advanced Manufacturing Support Centre to help manufacturing SMEs assess the possibility of adopting both advanced manufacturing solutions as well as social innovation strategies to become "factories of the future".

In order to fulfil this objective, the project has developed a framework of 7 transformations along which a company can evaluate its current situation and receive help with an implementation plan. The seven transformations focus on all aspects of enterprise transformation – from technology to human cantered approaches and eco-factory aspects.

The ADMA project has developed an assessment tool for SMEs to evaluate their position about factories of the future.

The assessment is conducted in two steps: starting with a short scan to map the situation of the company according to the 7 transformations, followed by a long scan. For each of the transformations, different aspects are considered and evaluated based on a level of advancement. Based on this, a benchmarking can be seen and implementation plan developed. The seven transformations are:

- Transformation 1: Advanced Manufacturing Technologies.
- Transformation 2: Digital Factory.
- Transformation 3: ECO Factory.
- Transformation 4: End-to-End Customer Focused Engineering.
- Transformation 5: Human Centred Organisation.
- Transformation 6: Smart Manufacturing.
- Transformation 7: Value-Chain Oriented Open Factory.

[7] *DIHNET.EU (2019), "DIH Champions Challenge guidelines for Applicants"*
[8] *https://s3.amazonaws.com/fundingbox-sites/gear%2F1562756270361-DIHChampions_Challenge_Guidelines+forApplicants_VF_10072019.pdf*
[9] *http://www.adma.ec/*

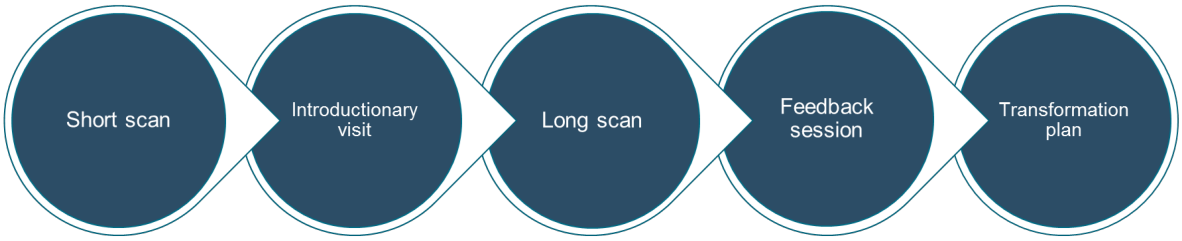


Figure 3: ADMA process

Various Digital Maturity scans for companies:

In the recent years, several self-assessment digital maturity scans have been developed for companies. Some concentrate on particular aspects (such as cybersecurity) others look at the organisational structures, the plans and ambitions and the capacities of organisations to digitise. SAH has used these tools as an inspiration for aspects that need to be addressed with our model.

Examples of such tools for companies include the PwC[10] Industry 4.0 self-assessment which distinguishes among 4 levels of digital maturity (Digital Novice, Vertical Integrator, Horizontal Collaborator, Digital Champion) along 6 different lines (Business models, product and service portfolio, market and customer access, Value chain and processes, IT architecture, Compliance, legal Risk, security and tax and Organisation and culture).

Other examples include the "Industry 4.0 readiness quick self-assessment tool" from TÜV SÜD[11], the Impulse "Industry 4.0 Readiness self-check for businesses"[12] tool which looks into strategy and organisation, smart factory, smart operations, smart products, data-driven services, and employee aspects and how they differ on 5 levels. There are multiple other similar tools available online.

The "Fraunhofer Industrie 4.0 Layer Model" has been developed to depict and structure the major areas related to Industrie 4.0. The model has three different layers:

1- Outer Layer: Enterprise Transformation
2- Enabling Layer: Information and Communication Technology
3- Core Layer: Production

[10] *https://i4-0-self-assessment.pwc.nl/i40/landing/*
[11] *https://www.tuvsud.com/en/i40-readiness-self-assessment*
[12] *https://www.industrie40-readiness.de/?lang=en*

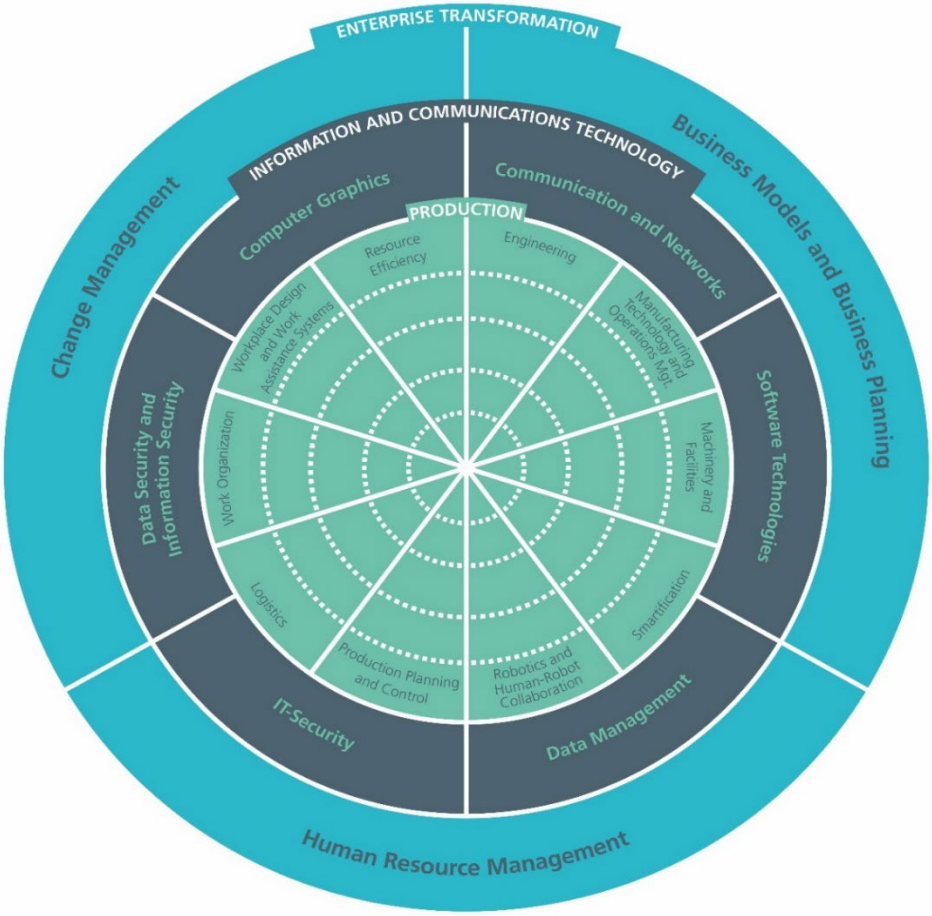


Figure 4: Fraunhofer Layer Model of Industrie 4.0 Value Creation

This model is used as the basis for a Roadmapping process, where an Industry 4.0-Readines check is carried out for manufacturing SMEs. Preconditions for the implementation of Industrie 4.0 technologies and methodologies and organisational changes have to be met and solutions often have to be selected or adapted based on the current maturity of the SME.

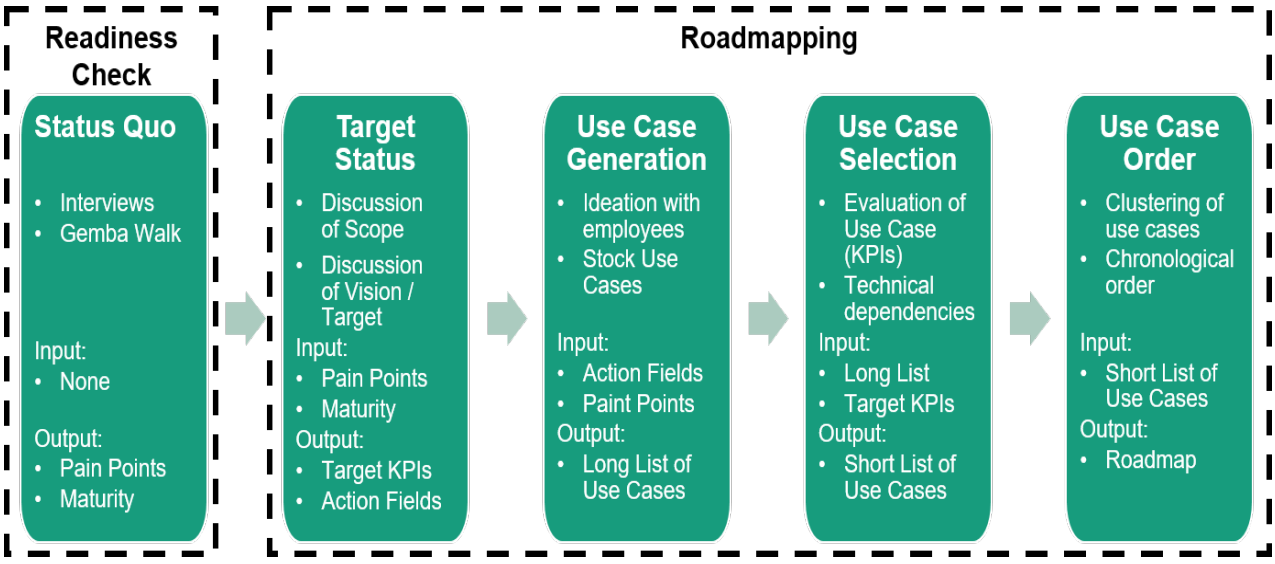


Figure 5: Roadmapping Process

The capability maturity framework

Next to the initiatives described above, SAH also used the capability maturity framework[13] as inspiration. The different levels and their explanations provide a solid basis on which a maturity model could be built.

This framework was created to assess the maturity of organisations regarding new software implementation. It was however also applied in other fields. The framework evaluates key processes, goals, common features and key practices, and process evaluation along 5-level process continuum, with the higher levels assuming better performance in processes resulting in optimisation and improvement. The maturity levels used are Initial, Repeatable, Defined, Managed (Capable) and Optimised (Efficient). The framework is process-oriented and the levels can be regarded as the degree of automation of business processes and agility with which (new) software is implemented.

A maturity model for innovation capability

A recent study from the University of Eindhoven (TU/e) on the maturity model for innovation capability of organisations (Arends, 2018) also used a design science approach to develop a maturity model for firm-level innovation capability, i.e. the degree to which an organisation is equipped to successfully innovate. Therefore, the study offers a useful perspective for the maturity of digital innovation hubs.

The outcome of the research describes main elements and sub-elements that constitute best practices of innovative organisations. For example, a main element is "Vision & strategy" with sub-elements Strategic Plan, Understanding Trends, and Communication & Roll-out. These can all be ranked on 5 maturity levels: Ad hoc, Intermediate, Low, High and Excellent. Based on these levels and building on some of the elements of innovative organisations, the SAH Innovation Services Maturity Model will include some general aspects of innovation capacity (tailored to the specificity of the hubs) and will adopt the ranking of the 5 maturity levels.

An interesting addition to the concept of maturities that came forth from this research is the concept of innovation archetypes. Archetypes score highly on several of the elements, but lower on others. Looking through this lens, organisations can for instance distinguish themselves by being very mature regarding processes that support innovation, but are not yet well positioned in the broader value chain. Another archetype can be an organisation that has a culture that embraces innovation, but still needs to adjust the processes more to respond flexibly to changes. This archetype approach indicates that there are multiple pathways that can lead to innovation success. We are considering adding this element to the SmartAgriHubs if the data from the tool leads to distinct profiles of archetypes.

Approach: Pillars

Inspired by the archetypes mentioned above and also based on the belief that there are aspects relevant for each of the services on which DIHs can excel or learn, so called "Pillars" were added to the alpha version of the model. Pillars are specific aspects that relate to the

[13] *https://en.wikipedia.org/wiki/Capability_Maturity_Model*

maturity of each of the possible services offered and could be applied to any additional service. These include topics such as capacity to offer the service (both organisational and HR-related), the procedural readiness of the hub to support such a service, as well as the revenue model per service (i.e. how is the DIH ensuring financial sustainability of this service). Consequently, these aspects (Pillars) have been incorporated in the SAH ISMM.

A hub may, for instance, already be very successful regarding the money it makes with its services, however related processes and aspects still remain ad hoc which can be a threat to the sustainability of a hub. Assessing maturity solely from an innovation service standpoint would not reflect that fully.

2.3 DEMONSTRATION AND EVALUATION OF THE ALPHA VERSION OF THE MATURITY MODEL

The WP4 team constructed a first (alpha) version of the maturity model. Based on the research as described above, we established services, activities, levels per service, pillars, and generic maturity-related items. Consequently, this alpha version of the model has been validated by three Smart Agri Hubs. We asked these hubs to reflect on all the aspects and descriptions in the model, both from an operational perspective (are the constructs clear? Are they relevant? Is anything missing?) and a meta-perspective (does the tool add value? How can it add more value?). The table below (The Valorisation by DIHs) describes the outcome of this validation round of the alpha version, through which it became the beta version as outlined in detail in chapter 3.

NB: as the iterations that came forth from the validation round are mostly on detail level, for reasons of readability and clarity we decided to include only the beta version in this document, rather than the both the alpha ánd beta version. Below we did outline on what items the adjustments were made. These adjustments are highlighted by the "**>>".**

	Smart Digital Farming, Flanders Belgium (Peter Rakers)	**Agriculture Digital Innovation Hub Poland (Lukasz Lowinski)**	**DIH 3 Greenport West-Holland, The Netherlands (Marga Vintges)**
Tool	+Clear and user friendly +It does not take too long +Because the services are thoroughly described, going through the tool already triggers a contemplation of current practices. -Explain some used concepts, e.g. TRL level >> Done -Do not make it too numerical >> Some numbers replaced by text; one construct taken out (Tip) Make sure it reflects different historical backgrounds of hubs	+Clear and user friendly -at General hub maturity sheet, I had an error in the formulas. (Tip) better if this will be web tool	+The tool can help us with our promotion activities ánd with our efforts to mature as an entity + It is accessible and understandable -It does not fully represent the structure of our hub as a window to the ecosystem, as all our services are offered by our ecosystem and not by the hub itself). Therefore, for instance, the hub itself has no income, but partners in the ecosystem do. >> Adjustment of the "governance" construct (Tip) Add open spaces for clarifications (Tip) Give advice right after filling it in

	Smart Digital Farming, Flanders Belgium (Peter Rakers)	Agriculture Digital Innovation Hub Poland (Lukasz Lowinski)	DIH 3 Greenport West-Holland, The Netherlands (Marga Vintges)
	>> Addition of open spaces, addition and adjustment of "governance" construct		
Services	+Well described, relevant and understandable +Good that concrete activities are mentioned -What could be added is the element of data (sharing, security, protection) >> Done. Possibly creation of new service later. (Tip) Align with list of services on other sources (e.g. project site)	+ Clear descriptions, well defined -In strategy development should be added as activity: technology foresight >>Done -In strategic RDI should be added as activity: idea scouting and possible living lab (as a driver to expand ideas) >> Noted for next release (Tip) The principle of cooperation and competition on an equal level favours development (developing new competences). >> Noted for future extension of the model	+They are clear and accessible to fill in (sometimes maybe too elaborate explanation) -We are asked for, and deliver, service on data security >> Done. Possibly creation of new service later. -More could be done with data sharing >> Noted for future extension of the model -Education / cooperation with educational facilities should be made explicit >> Done -The use of industry plans, business plans and technology fields as terms is confusing >> Terminology adjusted (Tip) Competition is possible on service offerings, too!
Maturities	+Clear descriptions. -Some are described in such a way that you would rather not choose them >> All descriptions made neutral in tone	+Well defined maturity levels per service	-TRL should be asked once and then no more to avoid confusion >> Done
Pillars	+Clear and logical	+Clear and logical	+They are clear and relevant

Table 1: Valorisation by DIHs

The next chapter describes the result of these iterations and validation: the beta version of our DIH Innovation Services Maturity Model.

2.4 DEVELOPMENT OF THE BETA VERSION OF THE MATURITY MODEL

Following the design science approach as described in 2.1 we consider the model defined in chapter 3 as the beta version of the model. Clearly, the implementation in the SAH innovation portal and potentially additional functionality brought new requirements and design and implementation decisions. Consequently, the implementation including the model is part of the beta artifact evaluation.

The development of the beta version took place in a number of steps. The first step is the dialogue with the organization responsible for the implementation ("developer") of the

Innovation Portal (Schuttelaar & Partners). The purpose of this dialogue was to understand the idea of the maturity model and to identify implementation and usability considerations. In this dialogue the concept was explained and the Excel prototype, used for the alpha evaluation, was handed over, together with the first version of this report. Based on this dialogue, the developers were able to produce some key screen designs in the look-and-feel of the Innovation Portal. These screens were then presented to gather some initial feedback. The screens were further shared in the WP4 team to gather additional feedback. The feedback was then discussed with the developer.

Due to unforeseen circumstances the further development of the system caught some delay. This led to the need to plan in more detail the process towards launch. The importance of the launch had increased, due to the decision that the DIHs participating in the SAH Open Call would be requested to complete a maturity assessment. The natural attraction of the open call would then turn into an incentive to complete an assessment, and thereby kick-start an improvement process, involving the DIH community (referred to the Friendly Peer Review Mechanism). However, the further planning would have to include piloting the system with end-users (i.e. DIHs), as well as leave room for improvement iterations and finalize before the Open Call commences.

The next step in the development included a close-to-complete implementation of the system in a separate and live demonstration environment (a copy of the Innovation Portal). Based on this implementation, feedback was gathered from WP4 team members, as well as colleagues from the respective organizations. Again, the feedback was gathered and discussed with the developer. In this process a particular concern, among a few others, regarding the user experience of the lengthy pages was identified. At that time, this could not be remedied immediately, as that would affect implementation seriously and cause delays for the piloting. So, in a few mini-iterations, the system was prepared for piloting with real-live DIHs. This evaluation is reported in the next section.

After that evaluation all comments and needs, both small and big were gathered and discussed with the developer. Based on this a prioritisation was made, to identify which improvements were needed to be implemented before launch. This included indeed and among other things, some rework on the presentation, focused on a better user experience. So, the launched (V1.0) version deviates from the beta version. In the meanwhile, new updates and functionalities have been implemented. The functionality to download a PDF file of the assessment, for example. We expect to need newer functionalities related to the assessment, once the Friendly Peer Review Mechanism has been designed. Also, the maturity model would benefit from a link to learning materials.

2.5 DEMONSTRATION AND EVALUATION OF THE BETA VERSION OF THE MATURITY MODEL

In order to demonstrate and evaluate the Beta Version of the Maturity Model, the following steps and activities where implemented:

A. Evaluation Activities:

- A separate and live demonstration environment was implemented: This environment was similar to the Innovation Portal.
- A set of instructions for testing were elaborated (Appendix I: Testing instructions)
- Two "friendly" Digital Innovation Hubs (ILVO and ŁUKASIEWICZ Research Network - Industrial Institute of Agricultural Engineering) accepted to evaluate the Model and provide feedback.
- The same evaluation approach took place also internally (between WP4 partners), and more specifically by TNO and Biosense.

The feedback was recorded in a structure form by using an elaborating and utilising a document called "MATURITY ASSESSMENT TOOL Friendly user test" (Appendix II: User Evaluation Form)

After the initial evaluation has finished, and the evaluators provided their feedback through the above-mentioned document, a set of teleconferences took place between the evaluators, the developing team, and WP4 team implementing the Model.

In order to be able to capture and therefore tackle all the requests and comments stemming from the evaluation phase, a "Maturity Model Evaluation Matrix" was implemented.

Based on that, the issues where categorised into Technical and Conceptual Issues, while Technical Issues where divided into 3 different sub-categories, namely, Purely Technical, User Experience (UX) and Conceptual.

In total, 35 Technical and 28 Conceptual issues where identified and tackled (The "Maturity Model Evaluation Matrix" can be found at (Appendix II: Finalisation Issues)

After the end of this process, the Maturity Model was finalised and was officially launched at the Innovation Portal

B. Demonstration Activities:

The demonstration of the Maturity Model took place in the context of the aforementioned dedicated Webinar[14]. The agenda of the demonstration comprised the following elements:

- Introduction & why? – explanation of the need and idea behind the maturity model. (Frank Berkers, TNO)
- Walk-through – a live demonstration of the maturity model as implemented. This showed the different screens and explanations. (Stavros Tsitouras, BIOSENSE)
- Assessment – a participating digital innovation hub explained its context, its assessment results and how it helped setting directions for improvement (Łukasz Łowiński)
- Discussion – allowing the audience to ask questions (Frank Berkers, TNO)
- Friendly Peer Review - a brief announcement of the upcoming friendly peer review (Luca Maini, European BIC Network)

2.6 CONTINUOUS IMPROVEMENT

As already discussed, after the evaluation all comments and needs, both small and big were gathered and discussed with the developer. Based on this a prioritisation was made, to identify which improvements were needed to be implemented before launch. This included indeed and among other things, some rework on the presentation, focused on a better user experience. So, the launched (V1.0) version deviates from the beta version. In the meanwhile, new updates and functionalities have been implemented. The functionality to download a PDF file of the assessment, for example. We expect to need newer functionalities related to the assessment, once the Friendly Peer Review Mechanism has been designed. Also, the maturity model would benefit from a link to learning materials.

[14] *https://www.youtube.com/watch?v=gH2yYsaSm7w&feature=youtu.be*

3. THE SMARTAGRIHUBS INNOVATION SERVICES MATURITY MODEL

In this chapter the (beta) model and all its contents are outlined.

3.1 CONTENTS OF THE MODEL

The model contains:

- General DIH maturity elements
- DIH Innovation Services
- Innovation Services Activities
- Maturity levels per service
- Pillars

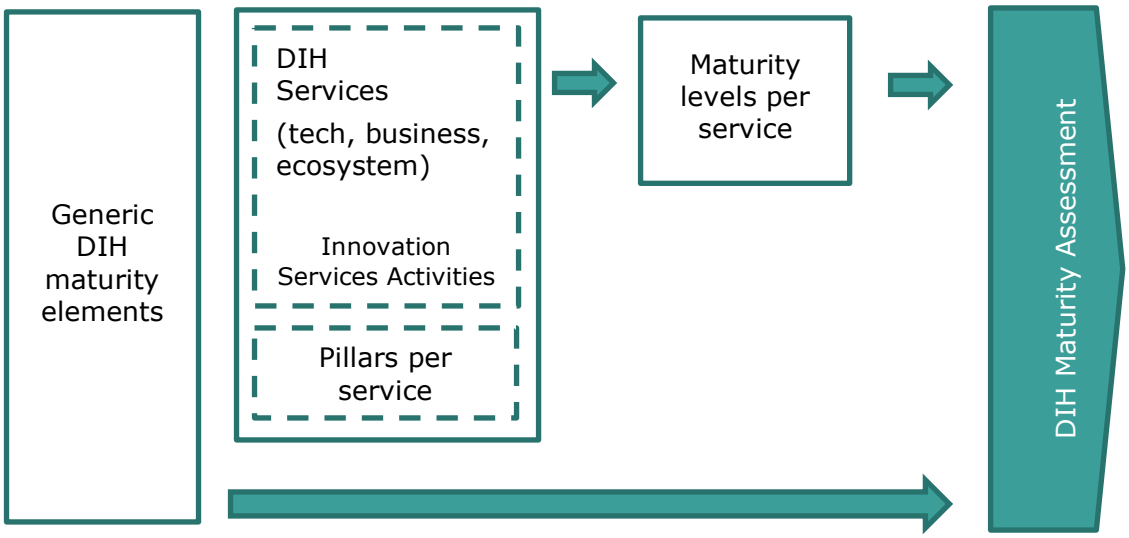


Figure 6: Graphical representation of the approach towards assessing DIH maturity and their services portfolio

General DIH maturity

First, we have established the aforementioned reference layer for the DIH's maturity. The topics we pose to the DIHs will help to place outcomes in perspective and prime the hub already for maturity-related thinking. The topics, with the levels the DIH can choose from, are the following:

Governance
1: The DIH operates as a project; the activities are conducted ad-hoc without formal procedures and the distribution of responsibilities and services is organised on a case-by-case basis. The DIH identity is still under development and not all the participating partners in the DIH have secured their commitment.
2: The DIH operates as a partnership among (two or more) consortium partners, however as some of the employees have a dedicated time to work on the DIH initiatives, they are still employed by their 'mother' organisation. Activities and services are being organised via informal procedures.
3: Projects and activities are promoted and undertaken under the umbrella name of the DIH. Activities and responsibilities are based on a consortium agreement, leveraging on the expertise of each of the mother

Governance

organisations. Governance is based on the core partners involved from the start of the DIH initiative and follow a project-by-project approach. There is no separate legal identity of the DIH, or there is but it encompasses no organisation (e.g. it is a foundation). Mission and vision are not internalised by all partners in the DIH.

4: The DIH has a separate legal identity, recognised by each of the partners of the DIH consortium. Employees are still affiliated to their 'mother' organisations. The responsibilities, activities, renumeration and IPR of each of the consortium partners are established based on informal agreements but an organisational structure is established to aid the consortium management. The vision and mission of the DIH are shared among the consortium partners. Priorities and their development are still based on individual initiatives and opportunities.

5: The DIH has a separate legal identity and dedicated employees. The responsibilities, activities, renumeration and IPR of each of the DIH consortium partners are formally and contractually established; referral and communication schemes have been procedurally established and implemented; management and organisational structure (can be flexible or loose) is established to aid the consortium management. Mission, vision and priority setting is based on the management and governance structure put in place.

DIH Experience

1: Not fully functional DIH

2: The DIH's experience is less than six months

3: The DIH's experience is between 6 and 12 months

4: The DIH's experience is between 12 and 24 months

5: The DIH's experience is more than 24 months

DIH structure

1: The DIH has its own staff members fully providing services.

2: The DIH has no staff members of its own, except for maybe someone representing the legal entity. Partners are responsible for delivering services.

3: Both the DIH and the DIH's partners have staff members working on DIH services.

DIH Business plan

1: The DIH does not have a business and/or sustainability plan, such as a financial prognosis of income/expenses.

2: The DIH has developed its first (set of) business model(s) as well as a short-term (1-2) years business plan, including a financial plan. The sources of income (including public funding) are not clear or secured yet. Income from the services is volatile and expenses outweigh it. Public funding is still the main source of funding for the DIH.

3: The DIH has refined its business model to match the demand for services. A long-term (3-5) years business plan has been developed, including a financial plan with some of the sources of income (including public funding) secured for the following 2 years. Income from the services becomes more predictable and is increasing but public funding is still needed to cover the majority of the expenses of the DIH operations. Plans to involve different revenue streams are developed and private investors sought out.

4: The DIH has developed a long-term (3-5) years business plan, including a financial plan, with secured public funding. The income from the provision of services is increasing. Different revenue sources are implemented (e.g. memberships, pay-per-services, showcases of technology, etc.). Private investments are attracted.

Financial sustainability

1: The DIH does not generate any income from private, membership, or public sources.

Financial sustainability

2: The DIH's income (generated from services, memberships, investments and project funding) is limited and cannot yet cover most of the current expenses. Public funding commitment is available on the short term for the operational expenses of the DIH.

3: The DIH's income (generated from services, membership, investments and project funding) can cover most of the current expenses. Public funding is secured for the mid-to long-term to cover financial gaps.

4: The DIH is marginally profitable and requires less public funding to support its daily operation. Some basic public funding may still be needed to sustain certain activities.

5: The DIH is generating significant profits and/or has a significant surplus.

How many customers / paying members do you have?

1: Less than 5

2: Between 5-10

3: Between 10-20

4: Between 20-30

5: More than 30

Ecosystem

1: The DIH does not have any established partnerships/connections/relationships with other stakeholders (beyond core consortium partners).

2: The DIH has laid the basis for relationships and some partnerships with stakeholders, mainly on operational matters.

3: The DIH has established relationships and/or partnerships with local and regional stakeholders.

4: The DIH has established relationships and/or partnerships with local, regional and national stakeholders.

5: The DIH has established relationships and/or partnerships with local, regional, national and international stakeholders.

Infrastructure

1: There is no relevant technology infrastructure provided by the DIH (or one of the DIH consortium partners).

2: Some basic technology infrastructure is available through one of the DIH partners. Most of the services that require infrastructure must be subcontracted.

3: A passable volume/magnitude of technology infrastructure is in place. Some services that require infrastructure can be provided within the DIH, while others must be subcontracted.

4: Fully functional, up-to-date technology infrastructure is in place. Most of the services that require infrastructure can be provided within the DIH, while in some cases it must be subcontracted

5: Cutting-edge technology infrastructure is in place (either acquired by the DIH or provided by one of the DIH partners), covering the bulk of the services that require infrastructure. Subcontracting takes place only at exceptional cases.

What TRL level(s) does your DIH address mostly with its innovation(s)? Please tick all that apply

1: Basic principles observed

2 Technology concepts formulated

3: Experimental proof of concept

4: Technology validated in lab

5: Technology validated in relevant environment

6: Technology demonstrated in relevant environment

7: System prototype demonstration in operational environment

8: System complete and qualified

9: Actual system proven in operational environment

Strategic RDI

1: The DIH operates only a limited number of pre-competitive joint projects brought by the partners to create a critical mass. The focus is on lower TRL levels, often led by university and RTO partners of the DIH.

2: Research is mainly focused on lower TRL levels (3-4) but some additional services are being offered. Joint projects with different stakeholders are further established, together with an overview of relevant proposal calls. A limited number of new participants from the regional ecosystem are involved in new joint projects.

3: The DIH develops a portfolio of relevant joint projects with established success rate. The DIH builds a name for being a reliable partner. The DIH is also involved in strategic joint-projects that can increase its visibility on regional and international level. Individual regional companies are approached for (small) contractual services.

4: Joint and contractual research projects with the regular participation of regional stakeholders have become core services of the DIH. Through strategic joint projects the expertise of the DIH grow and its brand supported.

5: The DIH becomes one of the regional pillars with an established name and track record in developing successful strategic and contractual research projects for both lower and higher levels of TRL.

Number of technology fields (e.g. robotics, sensors) covered in the DIH

1: Less than 2

2: Between 3-5

3: Between 6-10

4: Between 11-15

5: More than 16

Skills and education

1: The DIH has no specific expertise in providing training or education for the advancement of skills.

2: Some form of basic training can be provided for a few knowledge fields.

3: The DIH has a number of structured training programs, while it can also support training through in-house infrastructure.

4: The DIH has a significant number of structured training programs. Fully functional infrastructure is in place to provide these programs.

Skills and education
5: The DIH is considered to be a "centre of excellence" considering the provision of skills and education, covering a wide range of knowledge disciplines.

Support with finance
1: When interested parties seek advice for finance sources, the hub searches for the proper funding tools, on a reactive basis.
2: The hub can initially guide interested stakeholders; however, it is not able to help them go through financing procedures (e.g. elaborate proposals, business plans) and actually acquire funding.
3: The hub can guide interested stakeholders towards the appropriate funding tools in an adequate way based on their needs, while it has the ability to partially draft proposals or initially connect stakeholders with the investing community., but mainly on a local, regional or national level.
4: The hub has already elaborated a number of funding proposals, directed to various sources of funding with a considerable success rate. Furthermore, the hub has expertise in national and international funding proposals.
5: The hub has an outstanding track record of successful funding proposals through several financing mechanisms. The employees are able to conduct large-scale proposals, while they have excellent relationships with the funding community (e.g. Venture Capitalists, Financial Institutions).

DIH Innovation Services

As previously described, the SAH Innovation Services Maturity Model will be based on the 3 types of services offered by DIHs – ecosystem, technology and adoption, and business services. As noted in chapter 2, previous research (Gijsbers, et al 2018, Butter 2016/2018) has pointed that DIHs need to offer a variety of services in order to perform the function of a one-stop shop and respond to the needs of the different customer segments.

Here follows a detailed description of the Innovation Services. This description has been developed based on the experience in previous projects (XS2I4MS, DIHNET, EU, etc)

Ecosystem services

DIHs are Public-Private Partnerships (PPPs) for innovation. DIHs often act as a spider-in-the-web connecting all relevant stakeholders and supporting the development of an active ecosystem in which collaboration and connections are fostered. Different types of organisations (companies, R&D, governments, education, etc.) need to work together as part of an innovation ecosystem if the DIH is to be a success (Gijsbers et al 2018, Butter 2016/2018, Butter et al forthcoming). Building such an ecosystem is not a trivial task and it requires a number of activities to set up and, once established, to run a DIH as part of an innovation ecosystem. To do so effectively, ideas and resources need to be shared for the benefit of the partners all stakeholders. But such sharing requires the development of trust and the development of mechanisms (MoUs, contracts). How ecosystem development activities are performed thus relates directly to the governance of the DIH i.e. its legal person and it organisational structure.

Some of these activities focus on sharing knowledge on new technologies and their impacts and benefits (for example workshops, seminars) while others can relate to brokerage and awareness creation. Usually, such activities are closely related to the local situation and needs of the regional ecosystem. These services are usually organised by the DIH coordinator/orchestrator acting in close collaboration with other partners. While all stakeholders benefit from the development of the innovation ecosystem, start-ups and SMEs

are rarely able to pay for such services. This implies that public funding is often needed to support DIHs. The specific ecosystem services are:

Community building

The hub collaborates with, and manages to engage, innovation partners (e.g. companies, competence centres, universities, governments) and end-users in order to stimulate awareness, collaboration and make an impact in the regional ecosystem. It is pro-actively seeking new relationships and collaborations and evaluating current ones in order to support the development of an active ecosystem in which collaboration and connections are fostered.

Strategy development

The goal of this service is that the hub can assist companies in identifying and assessing new technologies, market developments and needs, in different sectors and domains. Internally, the hub can develop and gather support from the ecosystem players for a higher-level long-term strategy and road mapping for future direction in the region. The hub turns outwards to engage with others to identify and keep track of new technologies and market development and create and maintain a clear position in the sector by communicating its strategy and vision. It also expresses its regional and international position and ambition.

Ecosystem learning

The way in which meaningful developments relevant for innovation are shared with affiliated organisations in the ecosystem. This may include sharing information on technology breakthroughs, competing technologies, data sharing, best practices, regulatory change, new companies, etc. A mature ecosystem learning service means the hub actively shares this knowledge and may be even known as an authority and consulted on ecosystem changes by others.

Representation, promotion

These are advocacy activities aimed at externally promoting the interests of the ecosystem and the hub during meetings with governments, companies, educational institutes, etc. It requires representation of the hub at different platforms that address different stakeholders, and (evaluated) promotional activities. The hub also may act as a representative of stakeholders in strategic policy and pan-EU collaboration meetings.

Technology and adoption services

These relate to the technology basis of the innovations that are developed and disseminated through the hubs. They include different types of R&D from strategic to applied and adaptive. This also relates to ensuring the intended users of digital innovations can and will adopt them. Furthermore, the services include providing know-how and access to state-of-the-art infrastructure available in Competence Centers (RTOs, universities, laboratories). As access to (often costly) infrastructure lowers the R&D costs for companies, they are often willing and able to pay for technological services. Still, SMEs often need help in translating these new technologies to the needs of their own enterprise and to understand the potential for their markets and customers. The specific technology and adoption services are:

Strategic RDI

Joint, pre-competitive R&D that aims at solving critical problems in the application of fundamental research. While the latter is the domain of universities and specialised research institutes, strategic pre-competitive R&D is often done by a competence centre in the DIH, often in collaborative arrangements with universities and other institutes. Examples of the

types of strategic R&D relevant for DIHs are the application of blockchain in industrial value chains, or robotics in dairy farming. Joint data sharing initiatives become more and more prominent for this service.

Contract research

Applied research to develop new products or services or to improve existing products. Specific R&D is often done at the request of companies or sector organisations (individual or group of customers/members) and includes concept development or proof of concepts.

Technical support on scale-up

Capacities to assist individual companies with the technological development of their product to prepare it for prototyping or small series production. Usually, this service would be provided by the competence centres that also have the access to required infrastructure.

Provision of technology infrastructure

(Renting of) technological infrastructure, equipment, data quality and security measures, and access to facilities for testing for individual companies. This includes renting high-tech equipment available to the DIH consortium partners as well as access to a data platform infrastructure (if applicable to the hub domain).

Testing and validation

Services related to certification and validation of the feasibility of the product. The hub has the availability of the needed infrastructure and the experience of offering the service as well as the needed expertise.

Business Services

DIHs are about the commercialisation of technologies. So, they should encompass a broad range of business development activities. These could vary from providing help in securing the needed funding and development of business plans, to offering training and education, and development of proposals for project acquisition. These services are often needed by enterprises to actually bring new technologies to their shop-floor. They can be organised by the DIHs through leveraging the expertise of entities participating in the DIH: financial institutions, governmental agencies, education and training bodies. The specific business services are:

Incubator/accelerator support

The hub offers entrepreneurs (both established SME and start/scale-ups) to grow their business by advancing their business models, attracting external sources of funding (e.g. venture capitals), enhancing their innovation potential, improve their technical- and soft skills, grow their network, and overall scaling up their business.

Access to finance

Access to finance refers to the ability of the hub to facilitate and inform individuals or enterprises about the process of arranging access to different funding sources (private or public) and support them with developing bankable proposals, thus promoting the growth of entrepreneurs, start-ups as well as established companies by exploiting growth and investment opportunities.

Project development

Project development refers to the ability of the hub to provide services concerning the overall life cycle of a project, from scouting of opportunities, proposal writing, initiation, definition and design, to development, implementation and follow up.

Offering housing

The extent to which the hub can provide office space to house enterprises or give them access to lab space or space for low rate production. Innovation spaces might also offer open spaces to promote ecosystem interaction.

Overall there are the services on **Skills and education**: the hub can provide a number of training services as well as the required supporting infrastructure for the advancement of skills on technology, ecosystem and business-related topics, for a wide range of stakeholders (large corporations, SMEs, individuals, intermediaries, other hubs). Activities are courses (bilateral mentoring, workshops, etc) for education on topics such as ecosystem, technology, business and strategy development.

The tables below provide a description of the specific activities associated with the services.

Innovation Service activities

Ecosystem services

Inno-vation service	Activities	Definition
Community building	Scouting and ecosystem analysis	Scouting and ecosystem analysis: DIHs often act as coordinators, connecting different stakeholders to support the digitisation of companies in the most optimal and efficient way. Core of these activities is to analyse the overall ecosystem in order to develop an overview of the demand for innovation and digital support among companies as well as the stakeholders in the ecosystem. This will enable the DIH to better support collaborations among actors and, if needed, address any unmet needs. This is about assessing the DIH landscape and in particular its borders.
	Ecosystem building	Once the assessment of DIH and its surrounding landscape is completed, the task of actively scouting, connecting and attracting the relevant partner organisations begins. This service can be viewed as a horizontal effort that aims to establish an active and collaborative community which fosters the exchange of ideas ánd value (e.g. money or data) among the different stakeholders. For this, the DIH needs to establish links with various stakeholders. Bringing all the necessary partners into the DIH requires a considerable effort. Agreements need to be reached between partners (MoUs, contracts, etc.). Mechanisms and instruments for networking, linking partners and stakeholders need to be developed in order to build a resilient community.
	Creating awareness	Informing the broader stakeholder community and the general public in the region and other interested parties outside it about the DIH, its plans and the possibilities to engage, are needed for successful establishment of the DIH. Raising the awareness among the ecosystem about opportunities of digitisation and innovative tech developments (see also ecosystem learning) is also important to generate interest and increase the 'client' base of the DIH. This includes activities such as participating in fairs, collaboration with sector associations and clusters, and promoting new opportunities with business development agencies.
	Brokerage	Linking suppliers and users of technology is a key task for the DIH. It aims to speed up the digital transformation process. It may involve a variety of activities: organising trade fairs, matchmaking, a help desk, and deploying specialised advisors.
	Dissemi-nation	Information about plans, activities and results need to be widely disseminated. Sharing best practices and relevant use cases are key activities.
Strategy development	Technology roadmapping	The development of roadmaps for technologies is a key tool to set the strategic direction for technology development and reach agreement among partners in the DIH.
	Market intelligence and market assessments	Analysis of market developments and market studies to assess demand for products and services are needed to underpin the business plan of the DIH. Market studies may focus on specific technologies, sectors or companies.
	Technology watch and scouting	The DIH will assist companies in the region in identifying and assessing relevant new technologies. Sources can be technology providers in the region as well as from other regions or countries using the experience of other DIHs (see also brokerage). More generally, keeping track of developments in the key technologies relevant to the DIH is important. However, doing these technology foresight activities may be beyond the capacity of individual DIHs and may require support from specialised organisations.

Eco-system learning	Workshops and seminars	The regular organisation of workshops and seminars to share information, knowledge, best practices and experiences. All to build a tight innovation community.
Represen-tation, promotion	Representing interests	Advocacy activities aiming at externally promoting the interests of the ecosystem and the DIH during meetings with governments, companies, education institutes, etc. DIHs active with representation are also visible at conferences, (country) visits, roadshows, etc.

Table 2: Activities for the Ecosystem services

Technology and adoption services

Inno-vation service	Activities	Definition
Strategic RDI	Joint, pre-competitive R&D	This activity is about experimenting with applying fundamental innovations to practice and making agreements on aspects such as intellectual property and use of data. By nature, this type of research usually goes beyond the scope of activities of a stakeholder or even an individual DIH as the technology solutions will be relevant to a range of DIHs in different regions and countries.
Contract research	Contract research	Applied research to develop new products or services or to improving existing products.
	Technology concept development	Applied research to develop new products or services or to improving existing products.
	Specific R&D	Specific R&D is often done at the request of companies or sector organisations and may include technology concept development and proof of concept development.
	Proof of concept	Demonstrating the feasibility of a technological idea or concept and its potential for real-world application.
Technical support on scale-up	Concept validation	Once proof of concepts have been developed, they need to be validated with producers, preferably in their companies.
	Prototyping	Prototypes are production models that include the key design elements and technologies that can be shown to and discussed with (potential) customers.

	Small series production	Once approved and validated, the prototypes are then taken into production - in small series to test their manufacturing readiness.
Provision of tech infrastructure	Renting equipment	Similarly, expensive equipment (e.g. for measuring and testing) is often underused by small producers or not affordable. Renting by the hour or for a specific task is thus an important service.
	Platform technology infrastructure	Often inaccessible for individual producers, the DIH can provide platform infrastructure such as data sharing platforms, drones (for agriculture), or access to cloud services.
	Technology demonstrators	Proof-of-concept prototypes or examples of conceivable future systems that provide tangible examples, showcasing how new technologies can be implemented in different scenarios. The main purpose of these demonstrators is to show businesses the potential of new technologies. The demonstrators might be based on the existing facilities or labs with which the DIH cooperates; the products resulting from pre-competitive research; or it can be provided by private actors aiming to reach a larger public.

Table 3: Activities for the Technology and adoption services

Business services

Inno-vation service	Activities	Definition
Incubator/accelerator and SME support	Supporting SMEs and start-ups	Assistance in shaping producers' strategies and action plans with regard to digitisation and other critical areas of renewal (e.g. human-centred production and eco-friendly production). The support might also take the form of providing opportunities to meet other (successful) entrepreneurs, to participate in different trainings, or to provide information on possible incubators/accelerators.
	Market assessment and "Voice of Customer"	Demand assessment related to a particular product or to the overall demand of the local market. This also relates to raising the awareness of a sector of the needs of the end-user as well as helping companies describe the benefits of their product in an understandable manner to the larger public.
	Business development	Identifying business opportunities, and developing business models for companies are important here, such as Make, Buy or Lease decisions, and selling products as a service (servitisation) which is an ever more important business model.
	Legal and Intellectual Property rights (IPR)	These are key tasks that are difficult to manage by small producers and where the DIH can support either directly via its partners or by referring companies to the right sources of expertise.
	Location	Decisions on where to locate production are difficult to take and DIHs can support their customers / members in making a solid assessment of the costs and benefits of different options.
	Sales strategy	Market assessment and business model analysis need to be followed up by specific sales plans targeting customers and customer groups.

Access to finance	Financial engineering	This activity embodies the process of arranging different types of funding, in different amounts, for different purposes at different stages of the innovation process. This includes providing financial advice to SMEs and other producers.
	Connection to funding sources	DIHs need to establish good relationships with public (regional, national, EU) and private funding sources (banks, venture capital, etc.) to ensure that the end-users get access to funding at the right time.
	Investment plans	DIHs support their customers / members in the development of bankable investment plans.
Project development	Identification of opportunities	Based on their knowledge of supply and demand (i.e. technology offers, and company needs), DIHs identify new product development and investment opportunities. This also includes identification of future topics for collaborative research, as well as monitoring of RDI project calls (at EU, national or regional level). This might also involve the identification of opportunities for projects from private parties, e.g. matchmaking among large companies and start-ups to work on a specific collaborative project.
	Creating consortia	Research, innovation and product development cannot be done by single actors. Forming strong consortia of technology providers, users, financial institutions and government organisations is thus a key success factor for DIHs and their customers / members. Based on their links with the different stakeholders, DIHs can also add value by exploring and building strong consortia for the participation in project proposals.
	Development of proposals	The preparation of strong project proposals that can be accepted by funding organisations is a core task of the DIHs.
Offering housing	Office space	DIHs can provide office space. Alternatively, they can broker between organisations with these facilities and potential users.
	Lab facilities	A DIH or one of its partners can provide R&D and testing facilities for companies that cannot afford their own labs.

Table 4: Activities for the Business services

Maturity Levels

Inspired by the analysis we did around maturity levels in general, we added the following levels to the ISSM:

	Level	General characteristics	In other words…
1	Ad-hoc	The service is only reactively offered upon demand, unstructured, DIH needs to find contacts for it, informal	Chaotic, very poor, initial, basic
2	Low	Short-term, slightly structured, an attributed task (besides other tasks) for someone in the organisation, the DIH has some experience in providing the service	Organised, defined, managed, poor, repeatable, accepted

	Level	General characteristics	In other words...
3	Intermediate	Mid-term, structured, someone works on it dedicatedly, the hub has an organisation in place and experience, and adopts best practice from other hubs	Standardised, supported, defined, average
4	High	Longer-term, the DIH adopts and applies best practice, actively sources from the SAH community	Predictable, measured, mature, developed, systematical
5	Excellent	Long-term, the DIH sets the best practice and actively contributes to SAH community	Innovation black belt, synergised, optimising, best practice, sustained

Table 5: Maturity levels

For the services themselves, these maturity levels can then be explicated as follows:

Ecosystem services

Community building	Ad-hoc	The DIH is not involved in any explicit collaboration or structured engagement with the regional innovation ecosystem. Relationships are often based on the shorter term and/or for operational purposes.
	Low	There are some existing relationships, but they are irregularly used. The ecosystem is extended as a response to demand from outside the DIH.
	Intermediate	Current relationships are known and exploited. Potential partners are regularly scanned and selected for collaboration.
	High	A diverse range of external partner relations is present and exploited, potential partners are scanned and selected continuously.
	Excellent	The organisation constantly evaluates and revises partnerships and has an attractive image in the community as being a partner. The DIH promotes new innovations and collaborations among different stakeholders.
Strategy development	Ad-hoc	There is no plan yet. The DIH does have some overview of the market trends and needs. Technology knowledge is based on the DIH's partners' expertise. Market assessment and scans are performed sporadically, e.g. as part of a feasibility study.
	Low	A vision on innovation and impact, mission and strategy are present and documented. Strategic focus areas are defined. The DIH actively follows a limited number of technologies and market sectors.
	Intermediate	A long-term innovation and impact vision, mission and strategy are present and well-documented, strategic focus areas are clearly defined, and these are updated regularly. The DIH follows, reports on and acts on available market intelligence and technology scans. The strategy is underpinned by important stakeholders. The DIH starts developing a track-record of market assessments and roadmapping with clients (or paying members).
	High	People in the organisation can consistently express the same strategy and milestones. The strategy is based on the experience gained via rigorous market- and technology assessments and roadmapping, involving key stakeholders in the ecosystem. The roadmap is shared with the ecosystem stakeholders who also adopt (parts of) it. Customers / members are served regularly with this service.
	Excellent	The DIH has a clear and established strategy and a roadmap supported by its main stakeholders. The strategy development process is done methodological and is a project on its own, through which the DIH maintains extensive knowledge and expertise on the technology and market developments. The DIH also has the human

		resources and expertise to continuously support and update other companies in their strategy development.
Ecosystem learning	Ad-hoc	The Ecosystem of a DIH learns on an ad-hoc basis, e.g. via presentations on occasionally organised seminars/workshops. There is no process in place yet to identify and share relevant developments. New developments are discussed informally in meetings and/or shared on websites, but not yet actively promoted.
	Low	The responsibility to regularly identify developments is appointed and carried out. Still, results and expertise are not widely shared among the ecosystem stakeholders and stakeholders are not actively contributing.
	Intermediate	The identification and sharing process is working and has regular knowledge sharing activities. Updates can be found in e.g. newsletters and organisation of events and the DIH keeps track of its knowledge sharing activities.
	High	New developments are actively discussed and interpreted and fed back to the strategy. Actors in the ecosystem have shared views on developments and are aware of knowledge sharing activities. Regular events (workshops, seminars, talks) are regularly organised to disseminate knowledge embedded in the ecosystem and the DIH.
	Excellent	The DIH is seen as an authority on identifying developments and consulted as such (e.g. by other DIHs national or international). New developments are actively brought to the DIH for dissemination and workshops, seminars and/or invited speakers are a regular part of DIH operations.
Representation, promotion	Ad-hoc	There are some promotional items (e.g. flyers, an initial/static website). Employees / those involved in the DIH are limitedly aware of the DIH strategy and vision but are not designated or equipped to position the DIH outwardly. Representation of the interests of the stakeholders and sector is still limited.
	Low	Some awareness exists within the DIH of the strategy and vision of the DIH. Outward engagement is irregular. Representation of the interests of the stakeholders and sector are conducted on opportunity or upon a specific request.
	Intermediate	Good awareness exists within the DIH of the strategy and vision of the DIH and outward engagement to position, represent and promote the DIH in the sector occurs regularly and planned (e.g. using a communication plan).
	High	Outward engagement for positioning, representing and promoting the DIH is a priority on all levels in the DIH and formally embedded in the DIH's daily processes. Representation of the interests of the stakeholders and sector are part of the regular, structured, and (when needed), prioritised activities of the DIH
	Excellent	Outward engagement for positioning, representing and promoting the DIH is a priority on all levels in the DIH and formally embedded in the DIH's daily processes. The approach to positioning, representation and promotion is constantly evaluated. The DIH actively seeks to represent the interest of the sector and stakeholders at various levels and has the backing of industrial stakeholder to represent them.

Table 6: Maturity levels for Ecosystem services

Technology and adoption services

Strategic RDI	Ad-hoc	There is no strategy or roadmap in place for RDI activities in the DIH, but topics / activities for RDI are dependent on individuals with interest in these topics. RDI activities do not necessarily align with each other.
	Low	Joint RDI projects are carried out sometimes and mostly constitute individual projects brought by the different DIH partners under the umbrella of the DIH. An RDI strategy with topics and activities is present within the DIH but not all projects are closely related to it.
	Intermediate	Strategic research moves from opportunity and project-based to selected and proactively sought areas of research. The RDI strategy is present and evaluated, and staff members are tasked to deliver it. RDI partners are known and relationships

		with them is managed. Potential stakeholders for collaboration (mostly from the regional ecosystem) are regularly scanned and selected for collaboration.
	High	Evidence-based approaches are established and accepted practice in the planning for RDI activities. Strategic RDI topics are pro-actively scanned, high potential ones are selected, and projects established. A diverse range of external partner relations for innovation purposes is present and exploited. The DIH is a partner with strong record in pre-competitive and joint projects and can establish links among relevant stakeholders to participate.
	Excellent	Strategic RDI topics are pro-actively scanned, high potential ones are selected (evidence-based) and projects initiated. The DIH actively approaches stakeholders from its regional ecosystem, but also other DIHs and foreign customers to undertake new joint research. Research topics are coordinated with the overall research and development strategy of the DIH (as opposed to an ad-hoc fit). Evidence-based approaches are established and accepted practice in the planning for RDI activities. Strategic RDI topics are pro-actively scanned, high potential ones are selected, and projects initiated.
Contract research	Ad-hoc	All existing projects are 'brought in' by the individual portfolios of the DIH partners, resulting in a limited coherence of the project portfolio. Partners approaching the DIH for specific R&D or concept development is rare.
	Low	There is an established track-record of contractual research facilitated by the DIH, such as specific R&D and proof of concept. Yet, most project are still attracted based on the expertise of a limited number of employees/consortium partner representatives and their previous portfolio.
	Intermediate	The DIH builds a name for being a reliable partner. Individual regional companies are actively approached for (small) contractual services, such as concept development. The DIH increasingly starts being approached for contractual projects.
	High	The DIH is increasingly approached by individual companies to support prototyping and product development on contractual terms. The DIH is approached to develop consortia and match different partners for research projects for specific R&D.
	Excellent	The DIH becomes one of the regional pillars with an established name and track record in developing successful contractual research projects, technology concept development and proof of concepts.
Provision of technology infrastructure	Ad-hoc	Technology infrastructure is provided by a limited number of partners in the DIH consortium and needs to be arranged on project-by-project basis. The DIH identifies technology to fit customer's needs.
	Low	Renting/using technology infrastructure, labs, and/or equipment of the DIH partners is arranged with structured and (contractually) agreed conditions. it is suitable for demonstrators or showcasing. Updating and expanding of the infrastructure is dependent on the 'mother' organisations of the consortium partners.
	Intermediate	The DIH itself starts acquiring technological infrastructure (or the consortium partners provide full access to theirs) which can be made available to customers or (paying) members. The infrastructure is reliable and regularly updated and the DIH has influence on the selection of new technology to be implemented.
	High	The DIH provides reliable, high-performance and economically efficient infrastructure, which is updated to high industry standards. This may include testing new technologies, prototyping, development of data platforms, collaborative tools and other related services for innovation purposes. The DIH regularly monitors and reports on technological infrastructure needs/usage.
	Excellent	The DIH provides reliable, high-performance and economically efficient infrastructure as well as specialist support for technical infrastructure and tools to SMEs and other stakeholders, e.g. for small-scale production. The DIH regularly monitors the technological infrastructure needs/usage and renews its infrastructure accordingly in a pro-active manner.

Testing and validation	Ad-hoc	There is no formal testing infrastructure, and processes or standards for testing are not yet defined by the DIH. Testing is carried out in an ad-hoc fashion.
	Low	A testing and validation process for product demonstration exists, meeting the DIH's policies and standards.
	Intermediate	The DIH has a well-documented testing and validation process. The DIH offers a portfolio of testing and validation services.
	High	Qualified staff for conducting testing and validation is present. Workstations are systematically updated with new tools. All validation tests are technically reviewed to ensure that results are repeatable.
	Excellent	The DIH has procedures to test and validate new methods. The technical expertise and infrastructure of the DIH are largely acknowledged. The DIH works with established certification bodies to contribute to standards or create new ones.
Technical support on scale-up	Ad-hoc	Technical support on scale-up takes place sometimes depending on the interest and capability of individual DIH partners. There is no structured execution process in place.
	Low	Tools and methods for support on scaling-up are identified and used by the DIH partners, e.g. in the form of concept validation and prototyping. Expertise is limited to what is available among partners in the DIH.
	Intermediate	The DIH establishes a portfolio of technologies in which it has expertise and can support companies to further scale-up their product. Relationships with other technology experts (with experience in other technologies) are initiated. Scaling-up of products after prototyping to small series production is possible.
	High	Several professional support tools are identified according to the needs of the market. Technical concept validation, prototyping and (provided that capacity and infrastructure are present) small series production is offered as a service and used by some customers (or paying members).
	Excellent	Facilities for piloting and demonstrating are available on-site, enabling businesses to test, develop and demonstrate new technologies without the risks associated with full-scale production. This can all be done in a safe and secure environment. These support facilities are constantly evaluated and improved accordingly.

Table 7: Maturity levels for Technology and adoption services

Business services

Incubator/accelerator support	Ad-hoc	Technical support on scale-up takes place sometimes depending on the interest and capability of individual DIH partners. There is no structured execution process in place.
	Low	Tools and methods for support on scaling-up are identified and used by the DIH partners, e.g. in the form of concept validation and prototyping. Expertise is limited to what is available among partners in the DIH.
	Intermediate	The DIH establishes a portfolio of technologies in which it has expertise and can support companies to further scale-up their product. Relationships with other technology experts (with experience in other technologies) are initiated. Scaling-up of products after prototyping to small series production is possible.
	High	Several professional support tools are identified according to the needs of the market. Technical concept validation, prototyping and (provided that capacity and infrastructure are present) small series production is offered as a service and used by some customers (or paying members).
	Excellent	Facilities for piloting and demonstrating are available on-site, enabling businesses to test, develop and demonstrate new technologies without the risks associated

		with full-scale production. This can all be done in a safe and secure environment. These support facilities are constantly evaluated and improved accordingly.
Access to finance	Ad-hoc	The DIH has limited awareness of existing or future funding opportunities available to support innovation development and adoption by the stakeholders in the region. No specific expertise (in terms of human resources) is available.
	Low	The DIH is aware it has only a partly picture of potential routes to providing access to funding. The expertise of the staff on this topic is fragmented.
	Intermediate	The DIH has a clear picture of potential ways for providing access to finance (private, public, national, regional, international) and experience in funding procedures (e.g. proposal writing, application to Open Calls).
	High	The DIH has a deep understanding and knowledge of the bulk of potential ways for providing access to finance, while different staff members are able to provide diverse expertise based on the needs of potential interested parties.
	Excellent	The DIH is considered as an expert in advising and combining different funding sources to a number of stakeholders, while it has an established Business Development (or similar) department dedicated for that purpose.
Project development	Ad-hoc	The DIH can provide general advice on project development, such as the overall process or possible partners.
	Low	The DIH is capable of handling a project's initiation phase and its initial design; however, it cannot form project consortia neither elaborate a full proposal.
	Intermediate	The DIH is capable of handling some parts of the project life cycle.
	High	The DIH is capable of managing the bulk of the lifecycle of a project - scouting for opportunities, building a consortium, proposal writing, initiation, definition and design, development and implementation. The DIH is able to make a work breakdown structure and conduct the requirement specification process as well as the actual project implementation. The DIH has a clear understanding of the purpose of multiple projects in various knowledge fields. A number of existing opportunities can be identified.
	Excellent	The DIH is able to completely manage the lifecycle of a project - scouting for opportunities, building a consortium, proposal writing, initiation, definition and design, development and implementation. The DIH has experience and is able to improve the quality of innovation projects through creative co-development, provide guidance, improve the innovation process and reduce potential risks, while it can also increase the probability of success of any project.
Offering housing	Ad-hoc	The DIH does not have the capacity or infrastructure to offer office space or experimentation/lab facilities to users.
	Low	The DIH has identified some possibilities to offer access to housing. Limited scheduled visits to use the available infrastructure for experimentation or piloting are possible but based on individual requests.
	Intermediate	The DIH has established specific procedures to grant access to office space or experimentation and pilot manufacturing infrastructure.
	High	The DIH is able to provide housing and office space. Open innovation spaces to (informally) meet with stakeholders are available. Renters of office space have access to the spaces for experimentation and piloting, but the services are not fully developed.
	Excellent	The DIH is in the position to enable companies to make use of housing opportunities as well as facilities for meetings and mingling with other stakeholders. The DIH becomes known for its collaborative atmosphere and attracts new stakeholders. Renters can also make use of in-house labs and spaces for experimentation and pilot manufacturing.

Table 8; Maturity levels for Business services

Pillars

In order to be able to better identify and assess DIHs maturity levels, and define more general characteristics through which a DIH can excel and learn, a set of basic service provision pillars was identified, namely:

i. Processes: This pillar will facilitate to identify whether there are established processes or not and in which degree, for the provision of specific services by the DIH.

ii. Human resources: This pillar will facilitate to identify whether there are human resources in place for the provision of specific services by the DIH.

iii. Financial sustainability: This pillar will help identify whether the services provided by the DIH, contribute to their overall sustainability, and in which degree.

We consequently defined a standardised set of maturity levels per pillar that can be applied to all innovation services. These levels are the following:

Processes

Pillar maturity levels		
1	Ad-hoc	There is no structure for providing the service, activities are performed based on individual initiative and available knowledge
2	Low	The DIH has put in place a basic structure/department for providing the service
3	Intermediate	The DIH has put in place a fairly organized structure/department for providing the service, formalising the activities based on expertise of the personnel
4	High	The DIH has put in place a well-organized structure/department for providing the service
5	Excellent	The DIH has put in place a fully organized structure/department for providing the service, including a standardised and customised service package

Table 9: Pillar maturity for Processes

Human resources

Pillar maturity levels		
1	Ad-hoc	There are no specific employee handling requests for the services.
2	Low	There are one employee handling requests for the services, however he/she does not have relevant expertise.
3	Intermediate	The Hub has 2 to 5 employees handling requests for the services, while some members of the team have solid experience.
4	High	The Hub has 2 to 5 employees handling requests for the services, while some members of the team have solid experience.
5	Excellent	The Hub has more than 5 employees handling requests for the services, while the majority of the team members have solid experience.

Table 10: Pillar maturity for Human resources

Financial sustainability

Pillar maturity levels		
1	Ad-hoc	The DIH does not generate income from the service and completely relies on public and in-kind contributions to cover current expenses.
2	Low	The DIH's income generated from service is insignificant and cannot cover most of the current expenses. Public funding and/or in-kind contributions and investments are needed to continue the service provision.
3	Intermediate	A fair amount of income from the service is generated to cover at least half of the operational expenses to offer the service.
4	High	A significant amount of income is generated from providing the service and this is sufficient to cover the expense associated with this service provision. Public subsidies or private investments are needed however to continue offering the service.
5	Excellent	The provision of the services constitutes a basic income source for the DIH, completely covering the expenses of providing the service. There is no need for additional funding to provide the service.

Table 11: Pillar maturity for Financial sustainability

Lastly, the DIHs are assessed on their funding mechanisms, by asking which ones they employ for each service. They can choose from the following list:

- Revenue generated per service provided;
- Revenue from memberships;
- Regional funding
- European funding (e.g. H2020 and service contracts, etc.);
- European Regional Development Fund which could be used by regions to support investments in, among others, innovation and research and digital agenda areas-areas often addressed by DIHs;[15]
- Private investments and
- In-kind contribution.

DIHs Maturity Level Results and Rating Methodology

The overall task of elaborating all the different maturity levels, identifying different pillars and setting up different sets of questions connected with different maturity levels (service specific and generic), is strongly connected with the results we wish to extract.

In this context, through the abovementioned tool, we are able to draw out a plethora of information about the maturity level of the DIHs, spanning from different "layers" of services as well as the overall DIHs maturity. As such we can deduct the following from the data:

DIH Generic Results (not service-specific):

We are able to identify the DIH Maturity Level for a set of questions that gives us an overall picture of the DIH maturity.

[15] https://ec.europa.eu/regional_policy/en/funding/erdf/

Results per service and pillar:

We are able to identify the maturity level for each service and for the corresponding pillars.

E.g. We can identify that the service Incubator/accelerator support has a high maturity level in the Processes Pillar but a low maturity level on the Financial sustainability pillar.

Overall DIH results per service:

We are able to identify the overall maturity level of a specific service (for all pillars).

E.g. The hub has an intermediate maturity level in Incubator/accelerator support service.

DIH Results for activities related to a service:

We are able to identify which activities a hub already conducts in relation to specific services. E.g. the hub offers SME support on market assessment but not on IPR.

Overall DIH Results for a group of services:

We are able to identify the overall DIH Maturity Level per group of services, namely Ecosystem Building services, Technology services and business Services.

E.g. The Hub has an intermediate maturity level in Business Services, a high maturity level in Ecosystem Building services and a low maturity level in Technology services.

Overall DIH Maturity Level Rating:

We are able to identify the overall DIH Maturity Level.

In the following table (Rating methodology), the methodology used in order to calculate the DIHs Maturity is outlined:

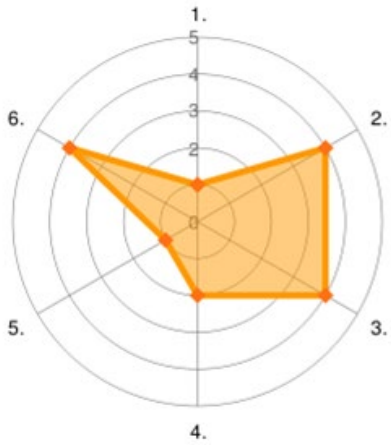
Maturity Level Results	Rating Methodology
DIH Generic results (not service-specific)	The rating is calculated based on the Maturity Levels that correspond to its question per service. No other calculation method is necessary.
Results per service and pillar	The rating is calculated based on the Maturity Levels that correspond to its question per service. No other calculation method is necessary.
Overall DIH results per service	The rating is calculated as based on the calculation of the average results of all pillars plus an overall self-assessment of the maturity per service.
DIH Results for activities related to a service	Here there is no rating. It serves as input for targeted advice on training, etc.
Overall DIH results for a group of services	The rating is calculated based on the calculation of the average results of all services belonging to a specific group of services.

Overall DIH Maturity Level Rating	The rating is calculated as following: Calculation of the average results of all above “layers”

Table 12: Rating methodology

4. PRESENTATION OF THE IMPLEMENTED MATURITY MODEL

Establishing a model is one thing; making the model accessible and functional for actually assessing maturity is another. To this end, an online tool is constructed that includes a calculation mechanism to establish the current maturity in general; per service; per pillar and overall. All items mentioned in Chapter 3.1 are part of an online tool (released May 2020) with automated calculations and an immediate results analysis for the DIH, e.g. in the form of a so-called spiderweb for the Innovation Services.



4.1 OVERVIEW IN STEPS

In order to better understand the functionality of the maturity assessment tool in the daily practice of hubs, we here describe a hypothetical use case scenario.

Step 1: The DIH links through to the online tool (which is placed under the DIH section of the Innovation Portal) either directly on the SAH website, or through a newsletter, tip from another hub, and so on. In order for the tool to become available, the DIH must be registered to the SAHs Innovation Portal (a detailed description of the process is provided in Chapter 4.2)

Step 2: The tool opens and is ready for use. It is planned that further details will then be autocompleted by details in the Observatory (if listed) or JRC (if listed). The DIH also agrees to that the data is used (anonymously) for aggregated data analysis.

Step 3: Initially, the DIH is asked to select the most fitting answer category on a number of generic (maturity-related) topics.

Step 4: Next, the DIH selects (from a drop-down menu) the services that it is already providing. Therefore, the DIH will only have to self-assess its maturity for the services provided. The hub then ticks the accompanying activities it provides. For the activities, these only serve as input on how DIHs are operationalising their services and what can be offered by the project on concrete support. No maturity is ascribed to the selected activities.

Step 5: The DIH proceeds through the self-assessment by choosing the most fitting answer categories (levels) in the same order as described in chapter 3. The whole procedure will take about 15 minutes.

Step 6: After the procedure is finished, an analysis is generated, e.g. in the form of a spiderweb.

Step 7: Based on the results, the DIH is prompted to the corresponding resources (trainings, materials etc.) which will help in the advancement of its maturity. This procedure is to be elaborated upon more in D4.5 and D4.5: Capacity building package of materials for the establishment of a Hub & Capacity building package of materials for operating a Hub

4.2 DETAILED EXPLANATION OF THE SCREENS

Stage 1: Getting access to the Maturity Model through SAHs Innovation Portal:

In order to be able to start using the Maturity Model, a DIH should first register to the SAHs Innovation Portal in accordance with the following procedure:

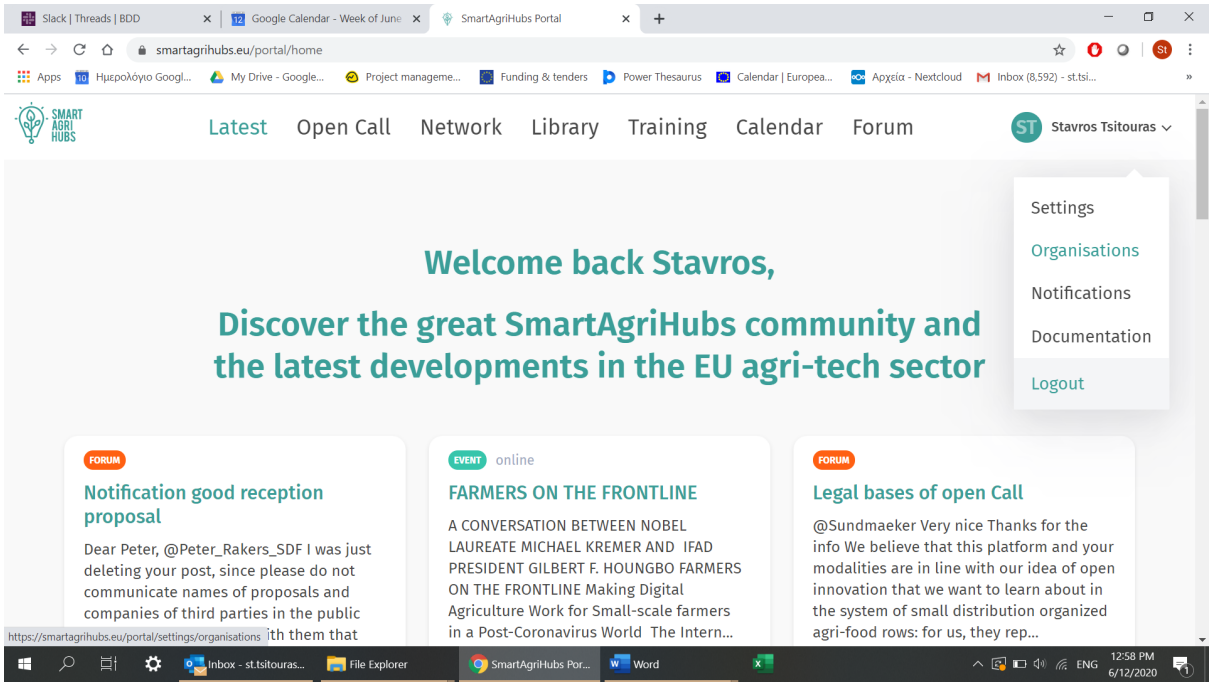
1. Create an account on the SAHs page:

https://smartagrihubs.eu/login

Verify the account through provided e-mail

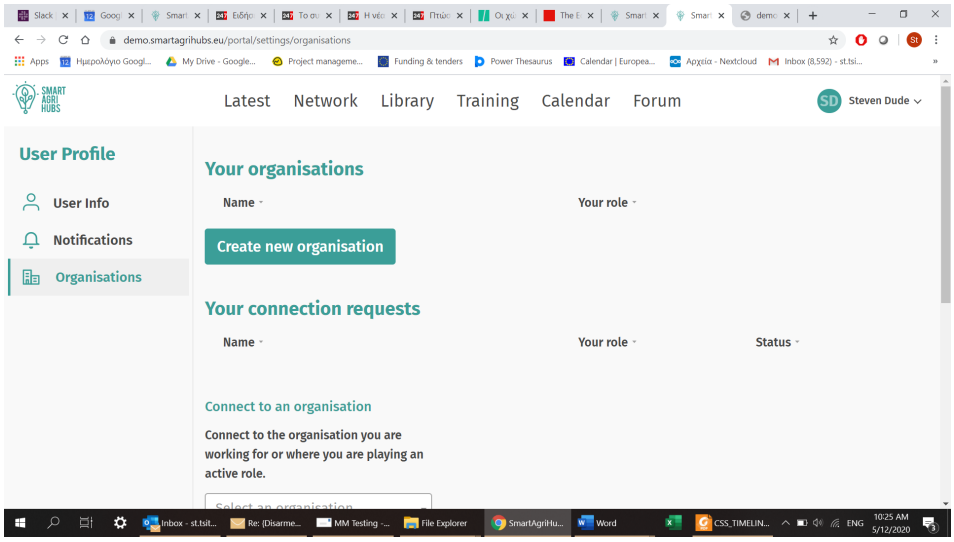
Log-in

2. On the right corner of the site, click on name and choose Organizations

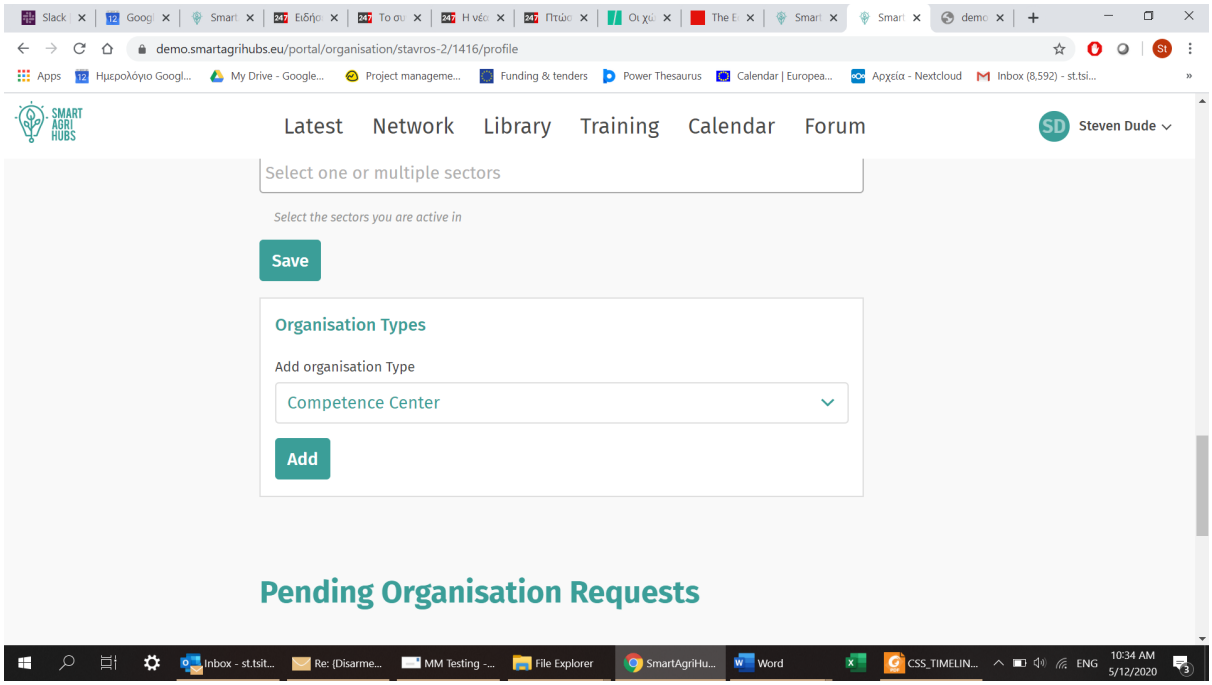


3. In case the DIH is NOT already registered choose: Create new organization

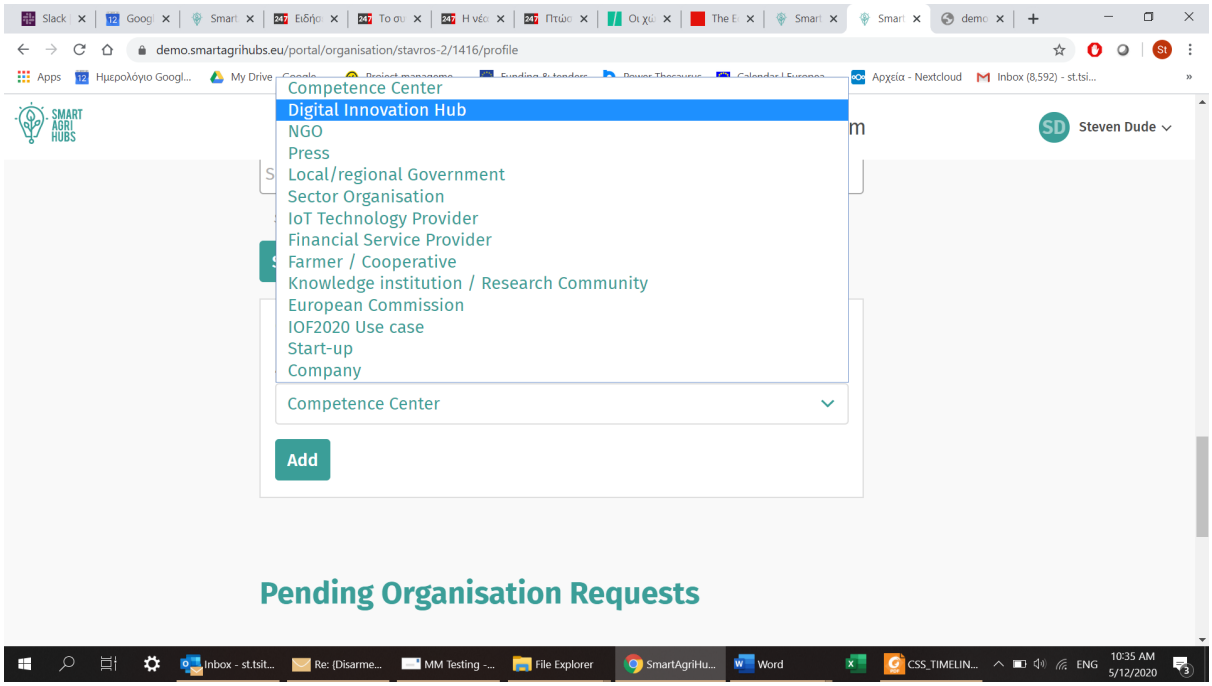
(In case the DIH has already been registered, go to step No 7)



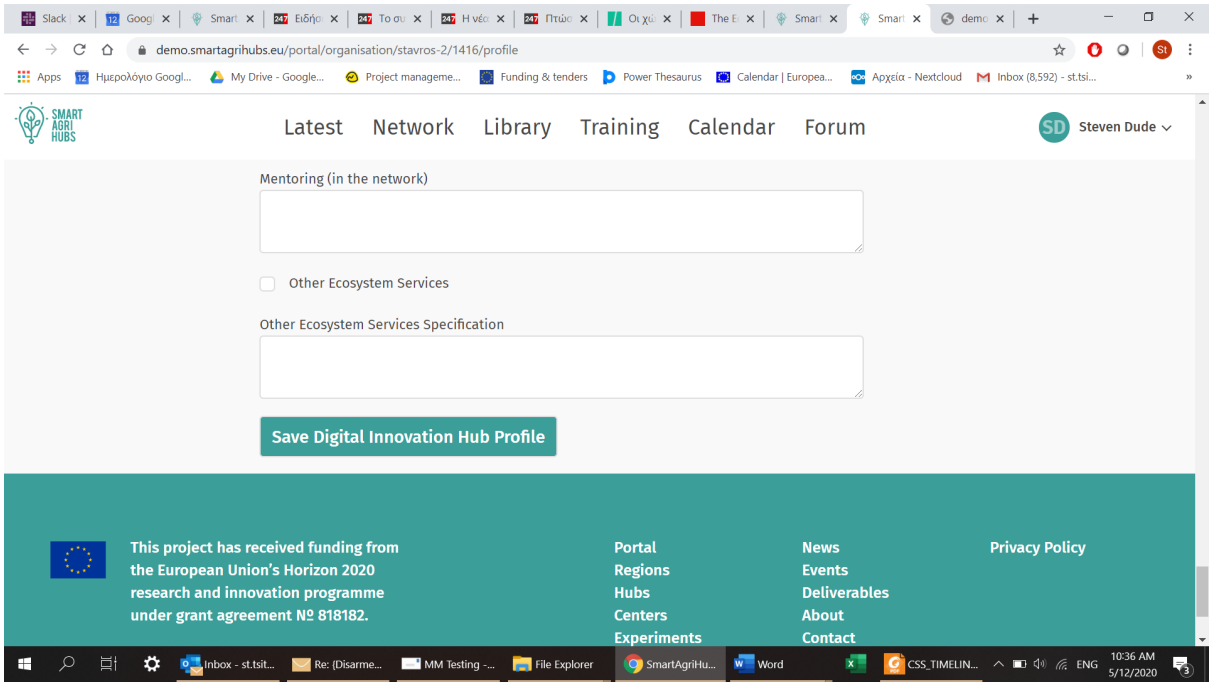
4. After the organization is created click on it; scroll down on the page where organization type appears



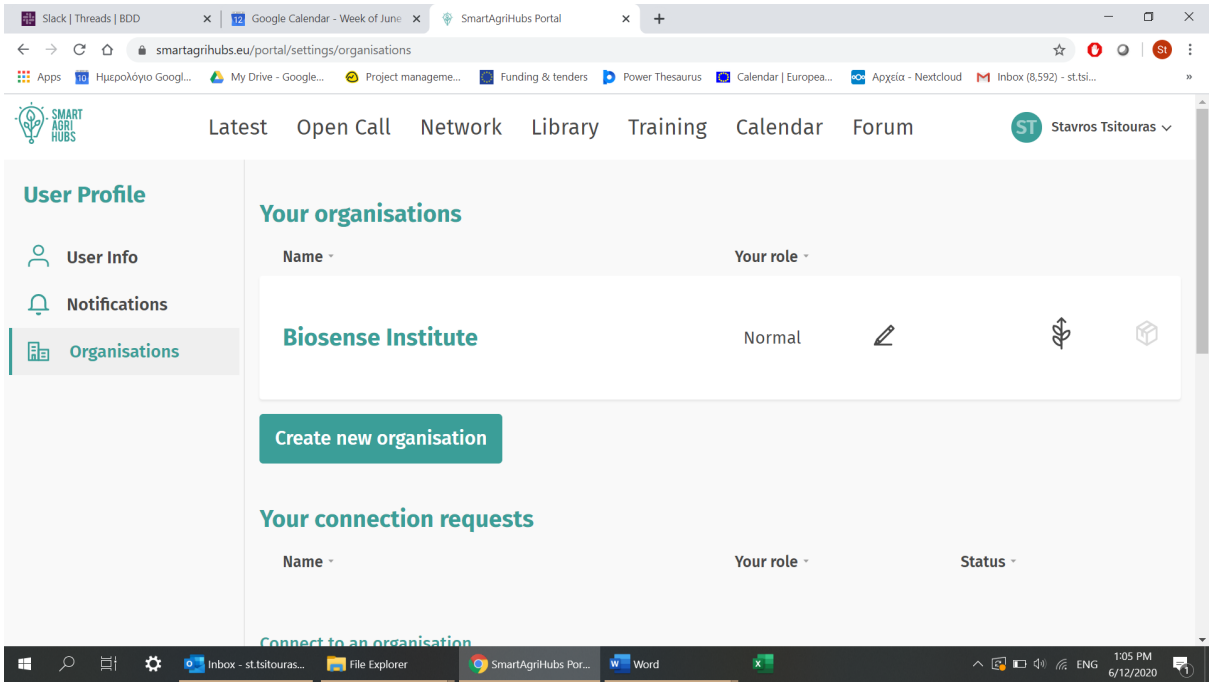
5. Choose Digital Innovation Hub and press add



6. Then Save Digital Innovation Hub Profile



7. Back to the Organizations Page, press the last growth symbol  for the maturity self-assessment and you are ready to start


Slack | Threads | BDD
Google Calendar - Week of June
SmartAgriHubs Portal
smartagrihubs.eu/portal/settings/organisations
Latest
Open Call
Network
Library
Training
Calendar
Forum
Stavros Tsitouras
User Profile
User Info
Notifications
Organisations
Your organisations
Name
Your role
Biosense Institute
Normal
Create new organisation
Your connection requests
Name
Your role
Status
Connect to an organisation
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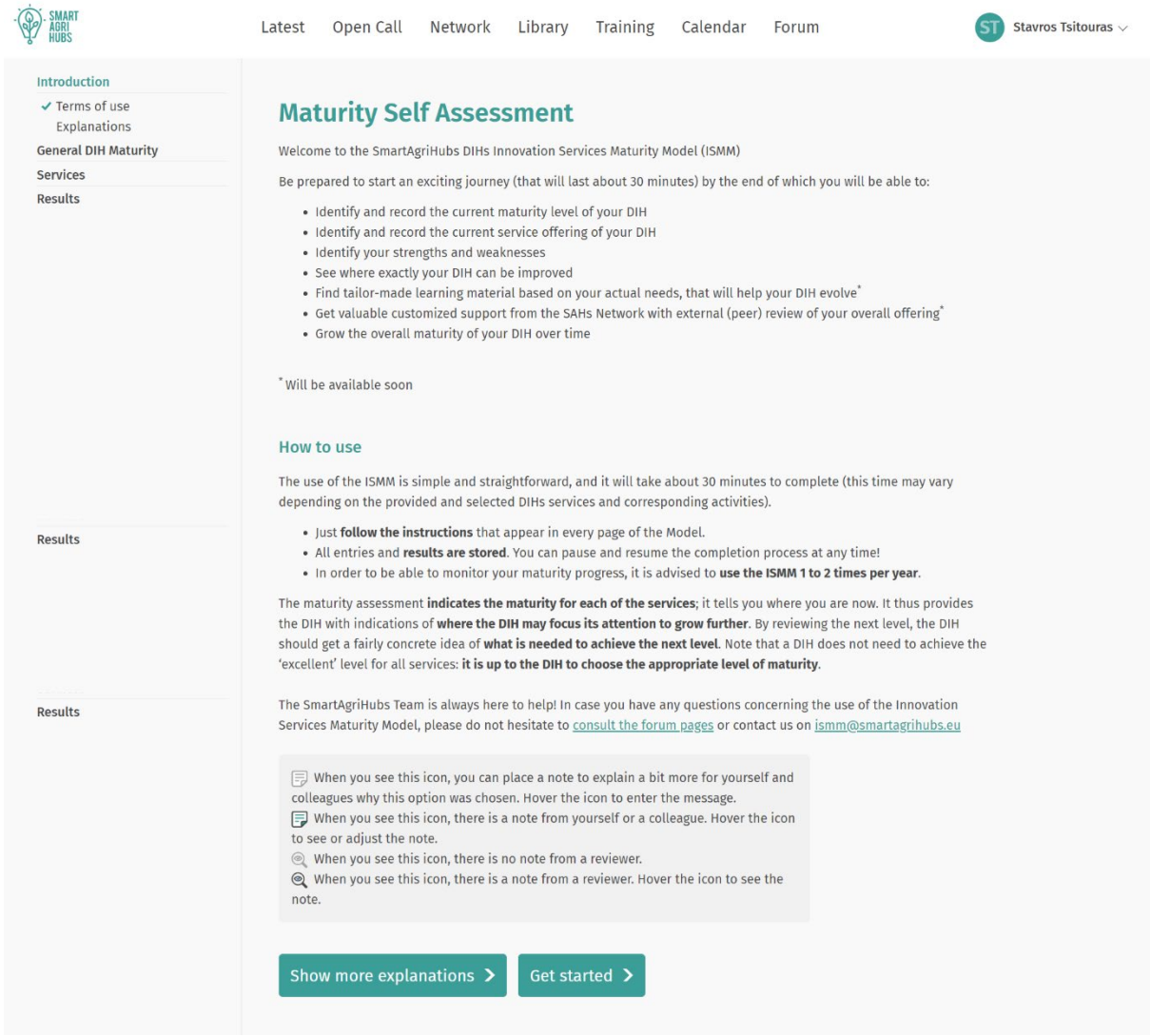
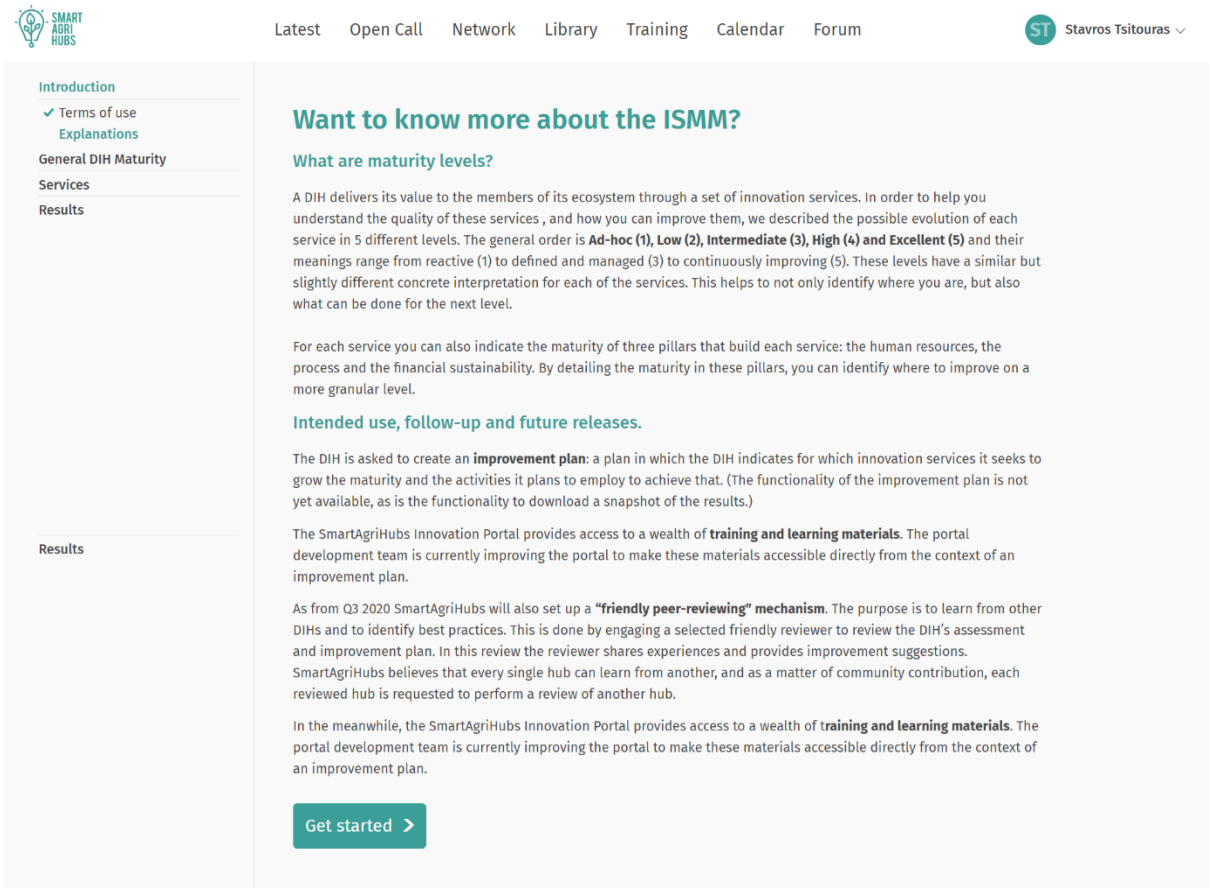
Stage 2: Using the Tool:

The next step is to actually use the tool:

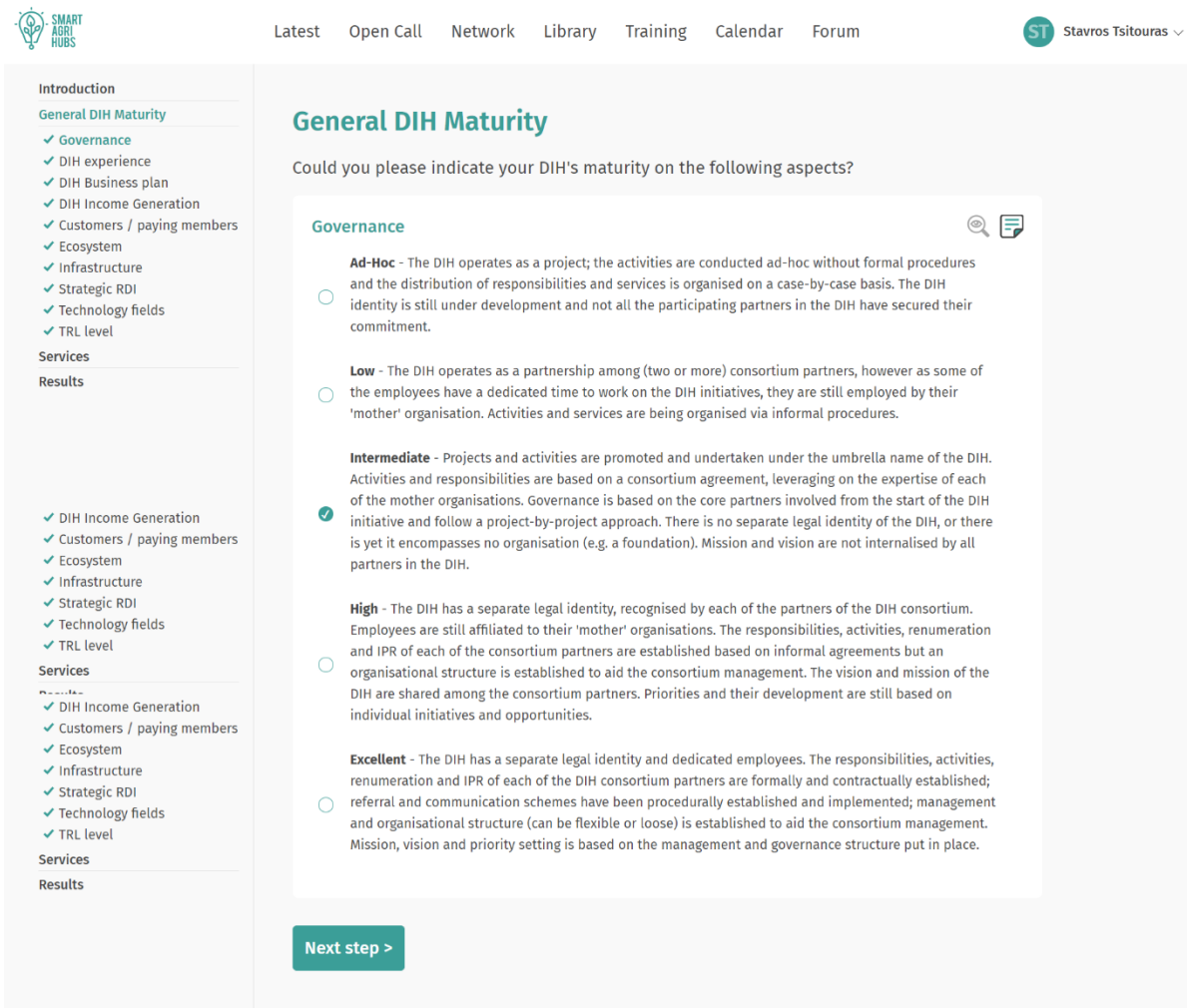
Welcome Page: The page provides useful introductory information:



Show more instructions page: More detailed instructions for using the Maturity Model



General DIH Maturity: In the next stages, the DIH provides information on its general Maturity on various aspects such as Governance, experience etc: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Introduction
General DIH Maturity
Governance
DIH experience
DIH Business plan
DIH Income Generation
Customers / paying members
Ecosystem
Infrastructure
Strategic RDI
Technology fields
TRL level
Services
Results
DIH Income Generation
Customers / paying members
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Technology fields
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Services
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Strategic RDI
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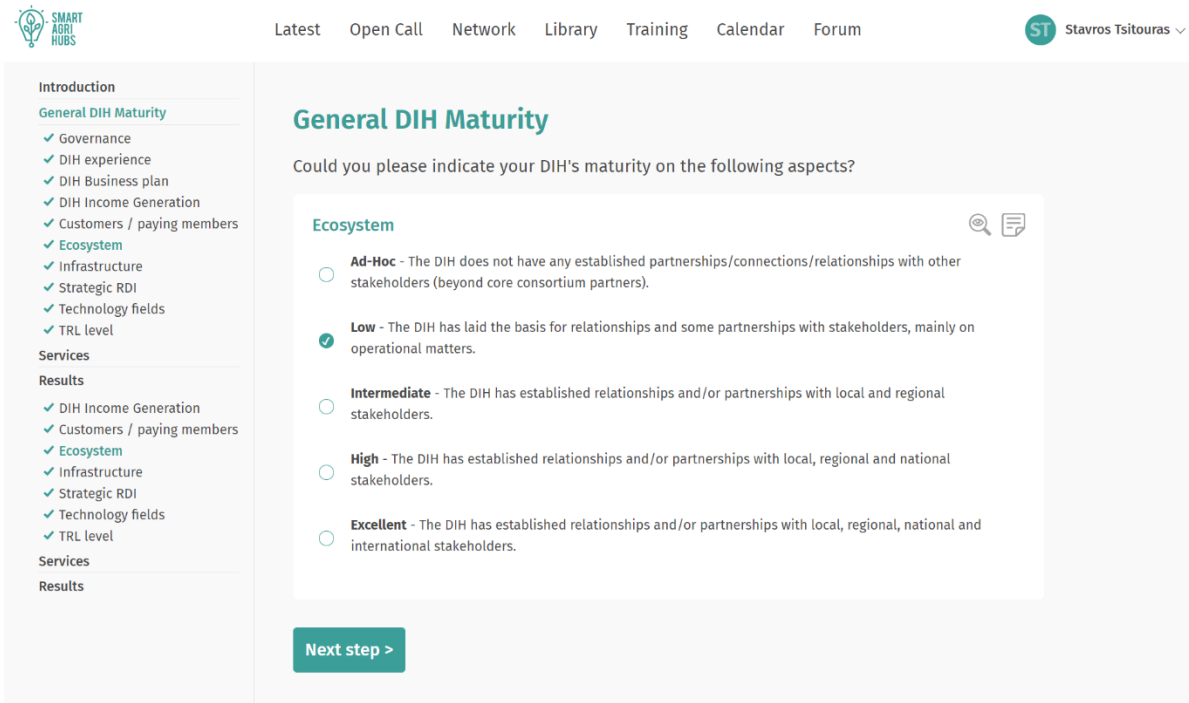
TRL level
Services
Results
General DIH Maturity
Could you please indicate your DIH's maturity on the following aspects?
Governance
Ad-Hoc - The DIH operates as a project; the activities are conducted ad-hoc without formal procedures and the distribution of responsibilities and services is organised on a case-by-case basis. The DIH identity is still under development and not all the participating partners in the DIH have secured their commitment.
Low - The DIH operates as a partnership among (two or more) consortium partners, however as some of the employees have a dedicated time to work on the DIH initiatives, they are still employed by their 'mother' organisation. Activities and services are being organised via informal procedures.
Intermediate - Projects and activities are promoted and undertaken under the umbrella name of the DIH. Activities and responsibilities are based on a consortium agreement, leveraging on the expertise of each of the mother organisations. Governance is based on the core partners involved from the start of the DIH initiative and follow a project-by-project approach. There is no separate legal identity of the DIH, or there is yet it encompasses no organisation (e.g. a foundation). Mission and vision are not internalised by all partners in the DIH.
High - The DIH has a separate legal identity, recognised by each of the partners of the DIH consortium. Employees are still affiliated to their 'mother' organisations. The responsibilities, activities, renumeration and IPR of each of the consortium partners are established based on informal agreements but an organisational structure is established to aid the consortium management. The vision and mission of the DIH are shared among the consortium partners. Priorities and their development are still based on individual initiatives and opportunities.
Excellent - The DIH has a separate legal identity and dedicated employees. The responsibilities, activities, renumeration and IPR of each of the DIH consortium partners are formally and contractually established; referral and communication schemes have been procedurally established and implemented; management and organisational structure (can be flexible or loose) is established to aid the consortium management. Mission, vision and priority setting is based on the management and governance structure put in place.
Next step >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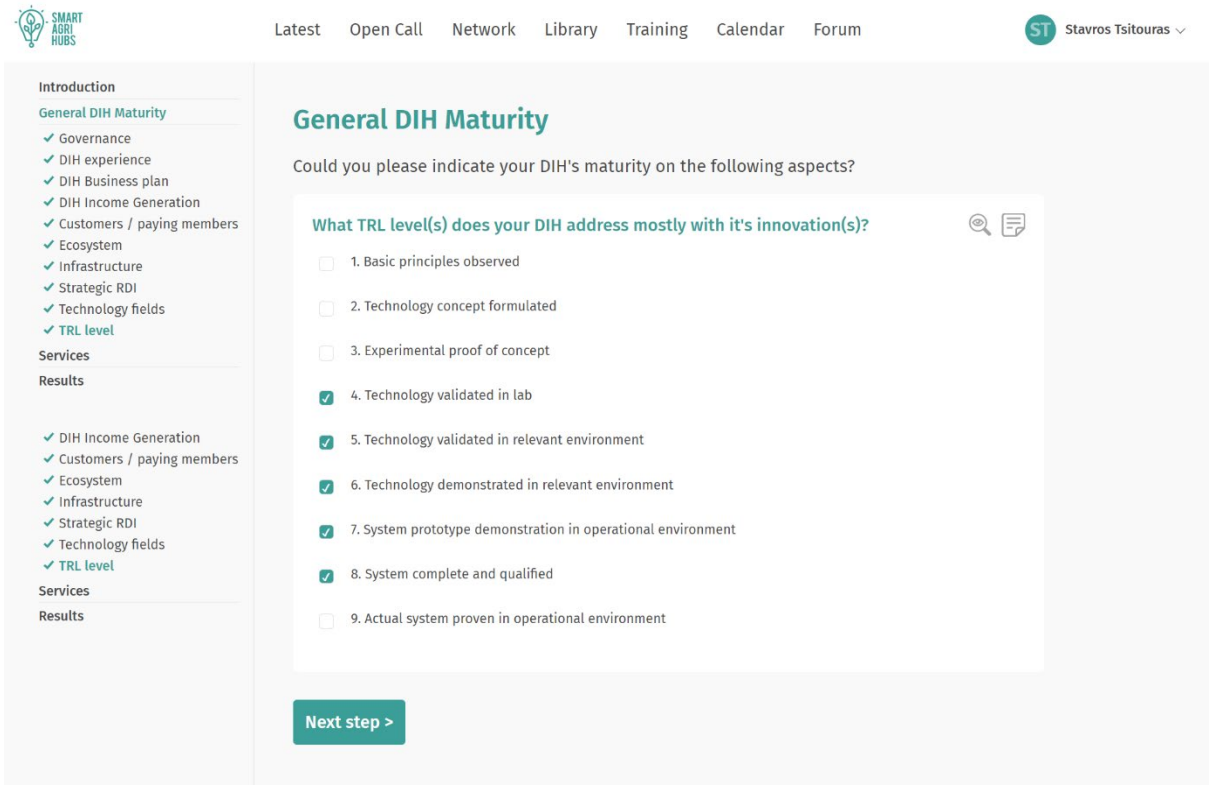
Technology fields
TRL level
Services
Results
DIH Income Generation
Customers / paying members
Ecosystem
Infrastructure
Strategic RDI
Technology fields
TRL level
Services
Results
General DIH Maturity
Could you please indicate your DIH's maturity on the following aspects?
Ecosystem
Ad-Hoc - The DIH does not have any established partnerships/connections/relationships with other stakeholders (beyond core consortium partners).
Low - The DIH has laid the basis for relationships and some partnerships with stakeholders, mainly on operational matters.
Intermediate - The DIH has established relationships and/or partnerships with local and regional stakeholders.
High - The DIH has established relationships and/or partnerships with local, regional and national stakeholders.
Excellent - The DIH has established relationships and/or partnerships with local, regional, national and international stakeholders.
Next step >

TRL Levels: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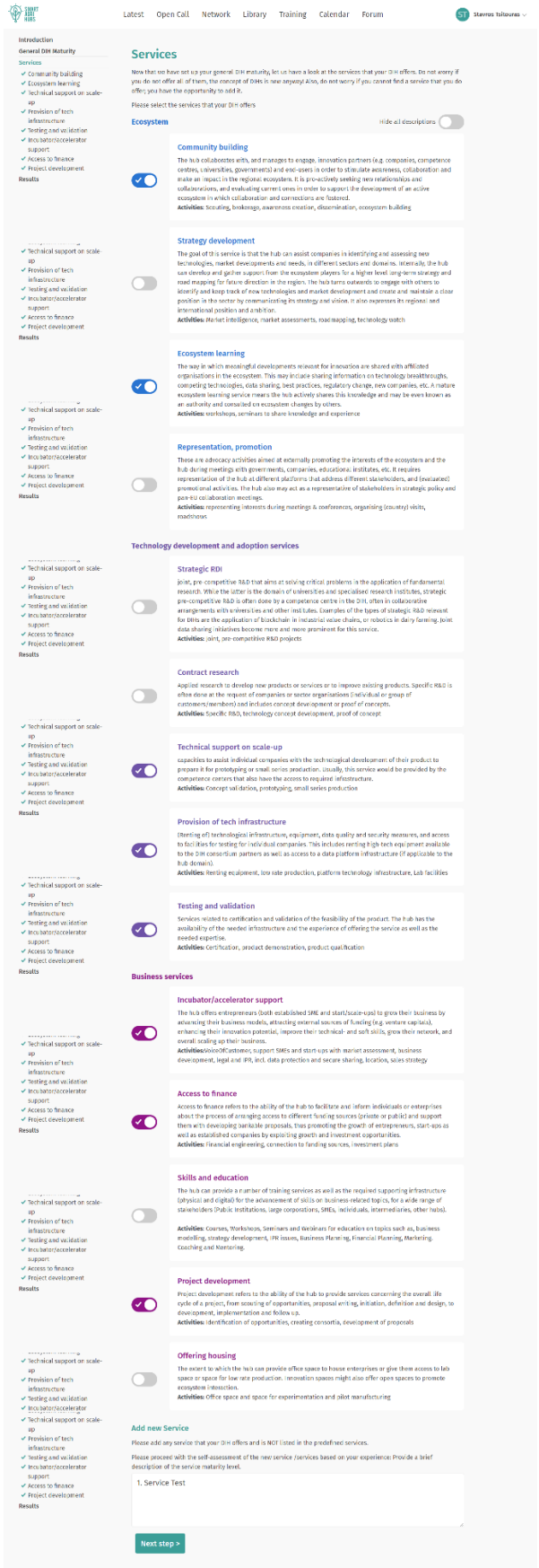
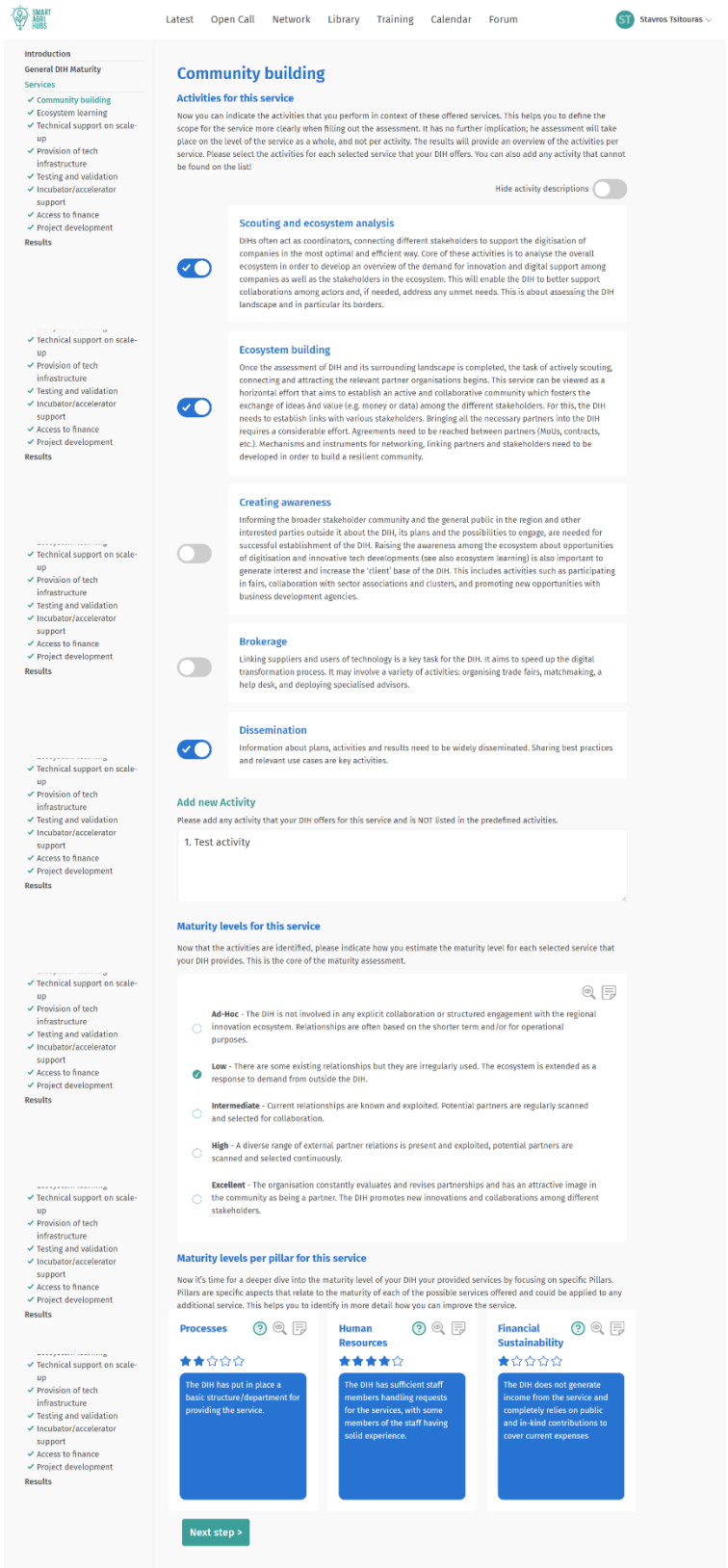
TRL level
Services
Results
DIH Income Generation
Customers / paying members
Ecosystem
Infrastructure
Strategic RDI
Technology fields
TRL level
Services
Results
General DIH Maturity
Could you please indicate your DIH's maturity on the following aspects?
What TRL level(s) does your DIH address mostly with it's innovation(s)?
1. Basic principles observed
2. Technology concept formulated
3. Experimental proof of concept
4. Technology validated in lab
5. Technology validated in relevant environment
6. Technology demonstrated in relevant environment
7. System prototype demonstration in operational environment
8. System complete and qualified
9. Actual system proven in operational environment
Next step >

Services: The DIH choses the services that it offers, while it also has the ability to add new services.

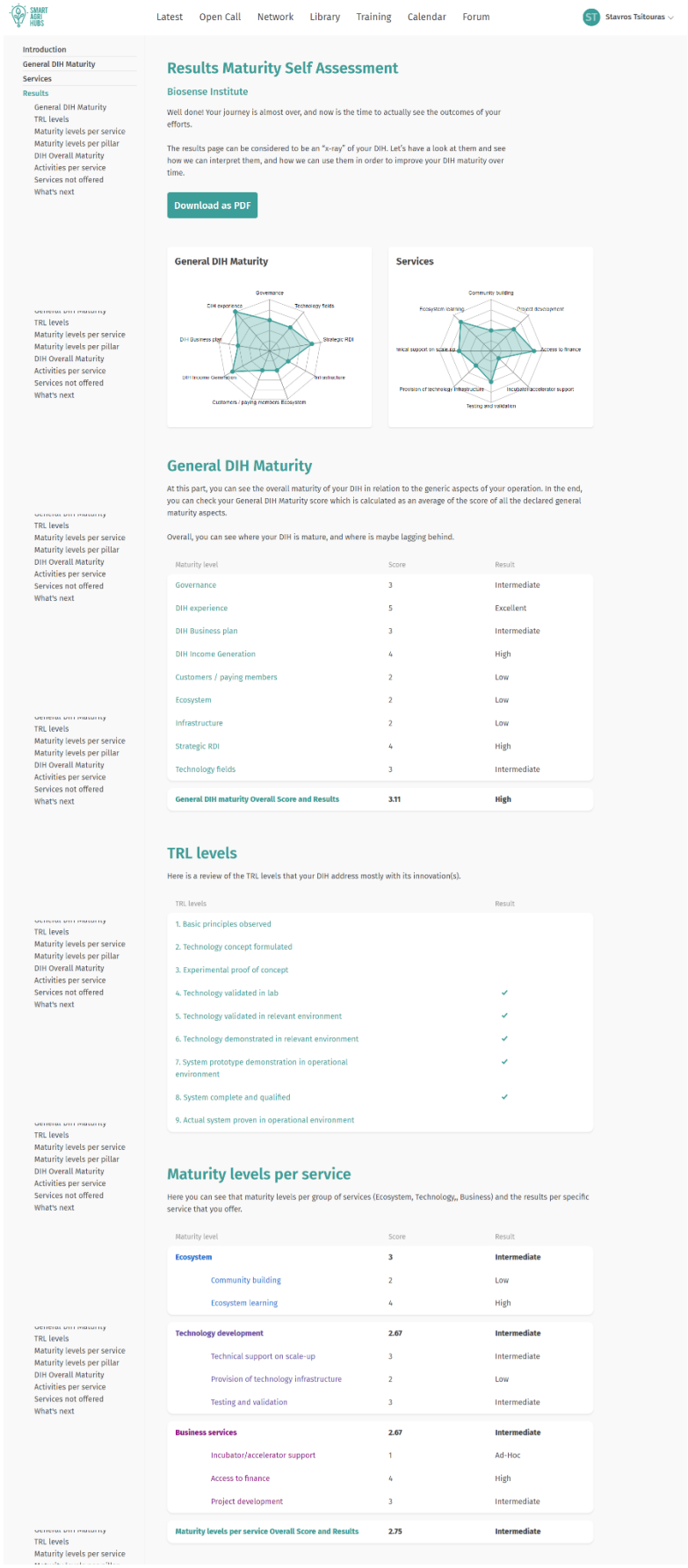


Activities for this service: The next step is to indicate the activities the DIH performs in the context of its offered services. New activities can also be added.

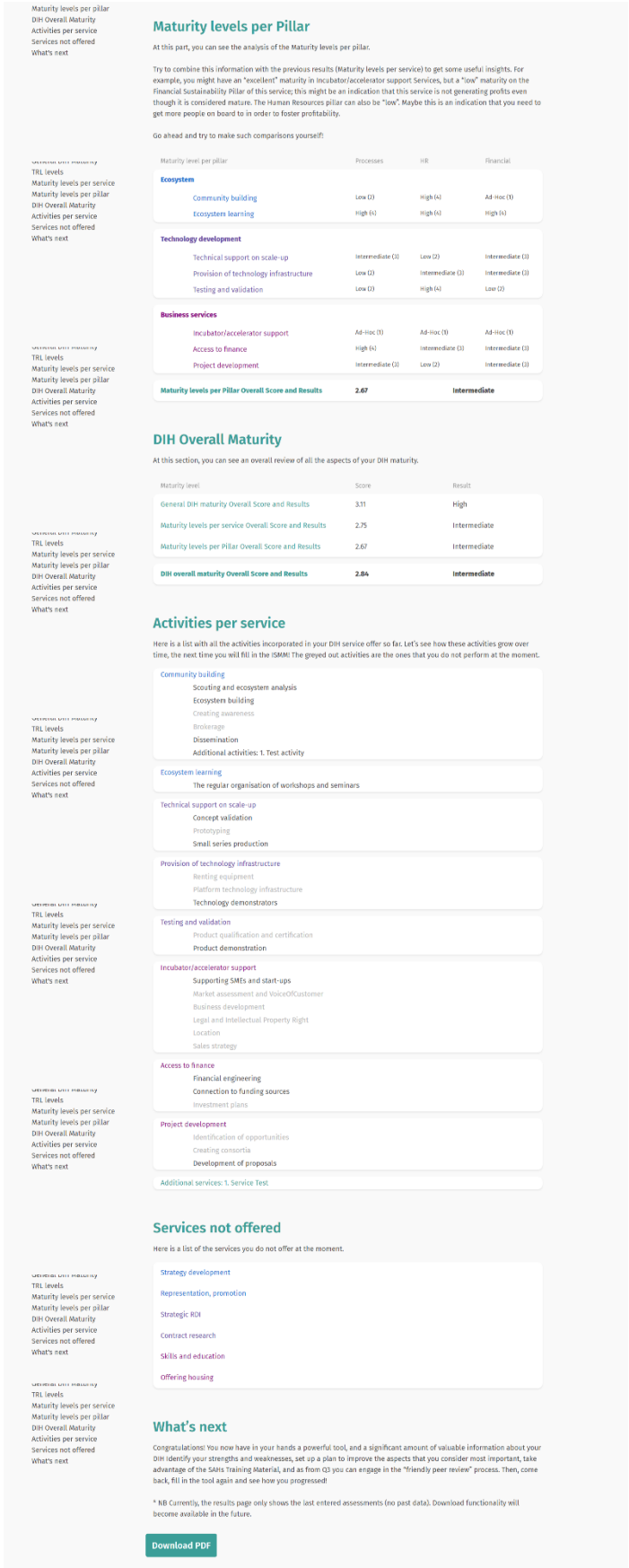
Maturity levels per pillar for this service: Furthermore, the DIH defines the Maturity level per pillar for the selected/provided services.



Results Page: An analysis of all the results of the Maturity Model (1)



Results Page: An analysis of all the results of the Maturity Model (2)



4.3 AFTER THE ASSESSMENT

Overall, the use of the Maturity Model facilities any DIH to:

- Identify and record the current maturity level
- Identify and record the current service offering
- Identify strengths and weaknesses
- See where exactly the DIH can be improved
- Find tailor-made learning material based on DIH actual needs, that will help the DIH evolve
- Get valuable customized support from the SAHs Network with external (peer) review of the DIH overall offering
- Grow the overall maturity of the DIH over time

Besides the above, the activities expected to take place after the assessment are the following:

- The DIH is asked to create an improvement plan: a plan in which the DIH indicates for which innovation services it seeks to grow the maturity and the activities it plans to employ to achieve that. (The functionality of the improvement plan is not yet available, as is the functionality to download a snapshot of the results.)

- The SmartAgriHubs Innovation Portal provides access to a wealth of training and learning materials. The portal development team is currently improving the portal to make these materials accessible directly from the context of an improvement plan.

- As from Q3 2020 SmartAgriHubs will also set up a "friendly peer-reviewing" mechanism. The purpose is to learn from other DIHs and to identify best practices. This is done by engaging a selected friendly reviewer to review the DIH's assessment and improvement plan. In this review the reviewer shares experiences and provides improvement suggestions. SmartAgriHubs believes that every single hub can learn from another, and as a matter of community contribution, each reviewed hub is requested to perform a review of another hub.

4.4 OVERARCHING LOGIC FOR USING THE MATURITY MODEL

By design, the maturity model is not meant as a stand-alone tool in the capability development of a DIH. It can be seen as the starting point of a continuous learning and capability development cycle, as well as a means of monitoring progress. This logic we have in mind, is depicted in the following diagram:

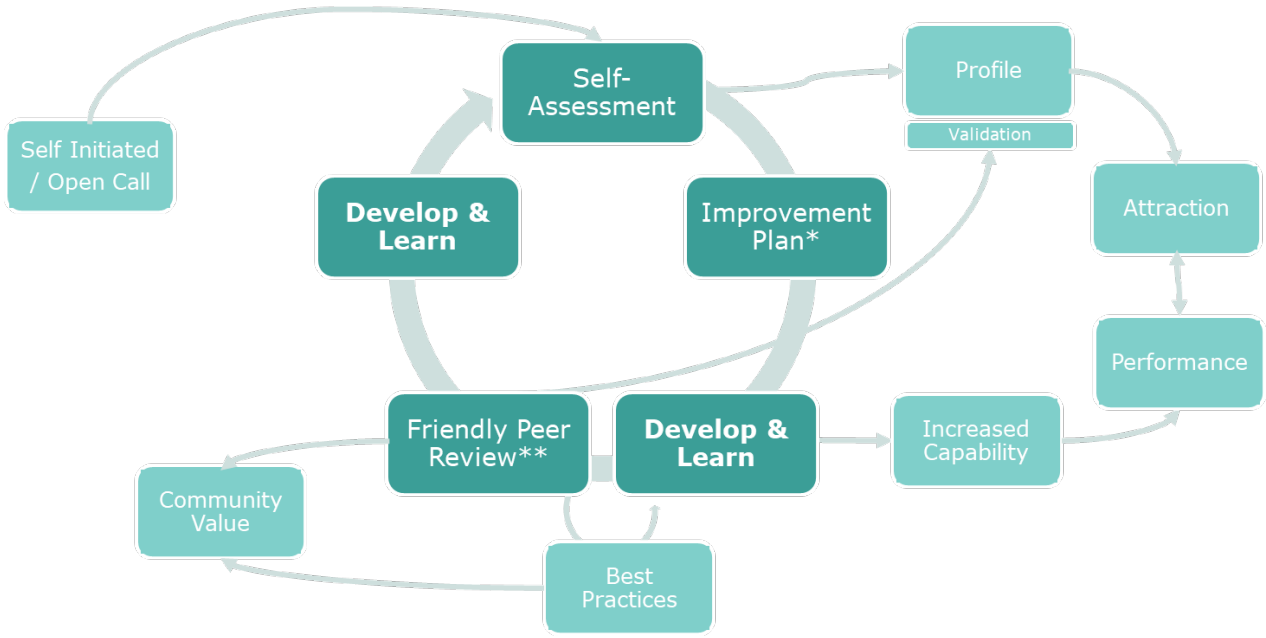


Figure 7: Logic for DIH capability building based on maturity assessment, peer review and open call.

The cycle starts for example with a maturity self-assessment and is followed by drafting an improvement plan. Based on this, the DIH will develop itself and also utilize learning materials, e.g. as provided in the Innovation Portal. Then, the self-assessment and the improvement plan are subjected to friendly peer review. This should improve quality, specifically of the improvement plan. Then capabilities will be developed through experience and targeted learning. After some time (e.g. 2-4 times per year) another maturity assessment is performed.

This learning cycle can be initiated at any time and the activities need not be performed in this specific order. The self-assessment can be self-initiated or be requested in context of the Open Call (see below).

The self-assessment helps not only the DIH to identify stronger points and weaknesses, it can also help to profile the DIH. This would for example be useful in case corporate innovators are interested in participating with a network of DIHs; then an indicator of quality would be helpful. In general, a well performing DIH is attractive to ecosystem partners. Note however that currently the maturity assessment is not public. External profiling can only be done on the data that the DIH decides to expose. This functionality, to publish assessment data to the public profile, is currently not available. This type of data is also needed for benchmarking (comparing your DIH to an average) and aggregate monitoring (how well are the EU DIHs performing), but also not available yet.

After the self-assessment, the DIH is encouraged to engage in a friendly peer review (see below). This means that an external reviewer, from another friendly DIH, will review the self-assessment and the improvement plan and make suggestions for improving these. The reviewer will also learn from this exercise. Also, the community benefits, since best practices are a requested output from this process.

Linking the Open Call to maturity assessment

With an aim to stimulate the capability development of the DIHs and to initiate learning by an initial maturity assessment, SAH linked the Open Call submission to the maturity assessment. In the terms of the SAH Open Call[16] the project expects participating DIHs to perform a self-assessment. ("*The participating DIHs shall plan the realisation of a DIH self-assessment to document their offered services and level of maturity using the maturity*

[16] *https://www.smartagrihubs.eu/portal/open-call*

model and self-assessment tool provided by SmartAgriHubs."). This helps to develop proposals that also strengthen identified points in the profile of the DIH.

Extensions for the forthcoming Friendly Peer Review Mechanism

Late 2020, the so-called friendly peer review mechanism will be implemented. SAH expects DIHs that use the maturity assessment functionality through the innovation portal, to also be reviewed and to provide for a review to another DIH at later stage. This is expected to add to the quality of the review as well as the strength of the DIH community.

This will involve a number of additions to the implementation of the maturity model. The design is not fully ready at this moment (v2 of this document), however a few functionalities can be mentioned.

- The is a PDF download of the full assessment results made available. This allows the DIH to share its assessment with others, e.g. the friendly peer reviewer.
- The reviewee can request a peer review
- The peer reviewer can access the online assessment, without altering it. But the reviewer will have the opportunity to provide comments.
- The reviewee will have the opportunity to document an improvement plan
- The reviewer can see this and provide additional comments
- The reviewer can identify best practices
- The reviewer can document the findings of the review
- The project should be able to see aggregate progress in maturity assessment, review planning and review execution.

4.5 REFERENCES TO ONLINE MATERIAL

https://smartagrihubs.eu/portal/trainings

https://www.youtube.com/watch?v=gH2yYsaSm7w&feature=youtu.be&ab_channel=I.Team

5. CONCLUSIONS, LIMITATIONS AND FUTURE WORK

5.1 CONCLUSIONS

SmartAgriHubs aims to improve the functioning of the hubs by substantially advancing the maturity of the services offered by the DIHs.

With the use of the developed maturity assessment tool to accompany our Innovation Services Maturity Model, we have the opportunity to extract useful insights in a very detailed manner. Based on the above ranking methodology, we can obtain and analyse a plethora of results that helps us guide the DIH towards establishing and improving the corresponding innovation services, e.g. by including services from ecosystem partners, such as competence centres into the portfolio, or by learning best practices from peer DIHs. We can identify which services need to be improved and under which pillars, while on the other hand, we can identify the "champion" hubs which in turn will become the "role models" for other DHIs. And it gives us input for extending the means through which the capacity building and mentoring of hubs can take place in the project and peer-learning from identified "champion" hubs who excel at one or more capabilities.

Furthermore, the tool enables us to monitor the progress of the DIHs in terms of maturity, while at the same time, the tool can be used as a benchmarking mechanism in order to draw useful conclusions through in-depth comparisons between different DIHs.

The system is live since May of 2020 and DIHs are encouraged to perform self-assessments in order to participate in the Open Calls of SAH. At this point there is no quantitative information on the actual usage available.

5.2 LIMITATIONS

We defined a few limitations of our model that we would like to address in later versions of the model, tool and/or deliverable:

- The DIH maturity evolves around the individual services. This list of services is however not yet fully stable, as other services are already popping up as relevant (e.g. on data security). The accompanying tool (more on this in 0) is planned to be designed that it can be updated as such (the first version was released on the Innovation Portal May 2020). Furthermore, as of yet, the maturity model, nor the innovation services have been interpreted in the specific context of agrifood.
- We yet have to decide on the exact ranking methodology. We intend later on to let the data speak through statistical analyses, in turn leading to more practice-based qualification of maturity levels (i.e. some levels may become obsolete).
- A critical assumption of our model is, of course, that more mature services lead to a better performance of the DIH. But what really defines our "champions"? Is it quantitatively the number or services it provides, or is a hub a champion if it excels at a few? Our approach is currently in favour of the latter; however, we will let the aggregated data speak on this also (e.g. are we detecting that more and more services will be chosen in the tool as years pass? Or not and do merely the levels increase?). Following from this, the earlier-mentioned archetypes may evolve from this.

- Still to be done is the setting-up of a maturity increase plan (and on how many levels), based on the SmartAgriHubs project KPIs. This is a focal point of Deliverable 4.4 and 4.5
- And last but not least: DIHs have to do the assessment themselves. They have to feel motivated to perform the assessment to establish their current position and feel empowered to work on their capability building. This requires awareness of our tool, desire to work with it and word-of-mouth talk of its existence, which, in turn, all will start with a lively exchange between DIHs, WP4 and the SmartAgriHubs project as a whole. As a means to incentivize the DIHs to experience the value of an assessment, we request DIHs that participate in the SAH Open Call to fill out an assessment. Late 2020 we plan to launch the so-called Friendly Peer Review Mechanism in which one DIH reviews the other, in turns. So, this is intended to create a community effort.

5.3 FUTURE WORK

Although the maturity model is one of the cornerstones in the SAH philosophy, and it is now implemented, it is also not finished. One can see the maturity model best as a catalyst: by gathering data from the DIH, and representing it in a structured way, the DIH should get a good idea of where to improve. However, in order to compare to others, or to decide how to improve, additional information is needed. The first requires aggregated data from comparable DIHs, the second requires a good understanding of the differences between the current and the next level. And also, insights and experiences. The latter are gathered and made available through the Innovation Portal and webinars. This is however not directly linked to specific maturity levels of specific services.

Friendly Peer Review Mechanism

In order to improve the quality of the assessments and its actionability, SAH is currently developing the so-called Friendly Peer Review Mechanism. The idea is that once a maturity assessment has been performed, that the DIH (reviewee) invites a knowledgeable person of another DIH (review) to critically question the assessment of the reviewee, to make concrete suggestions for improvement and to identify specific best practices that the reviewee has implemented. This would allow the reviewer also to learn for its own DIH as well as identify best practices that can be shared in the community of SAH. Furthermore, by requesting the now-reviewee to become reviewer for another DIH, the now-reviewee can 'return the favour' to the SAH community. This will create a reviewing process, in which DIHs assess and learn and improve. However, in order to support this process, several additions in the implementation are expected to be necessary. E.g. notes for the reviewer, space to draft an improvement plan and ways to document and store best practices. This all is under development.

Expected launch of the FPRM is Q4 of 2020.

Monitoring in the Observatory

In D4.3 the design the Observatory is captured. As the general DIH maturity is one of the key parameters for monitoring progress in a DIH's capabilities, it must be possible to monitor in different levels of aggregation the maturity of DIHs. Implementation of Observatory is expected to commence Q4 of 2020.

6. REFERENCES

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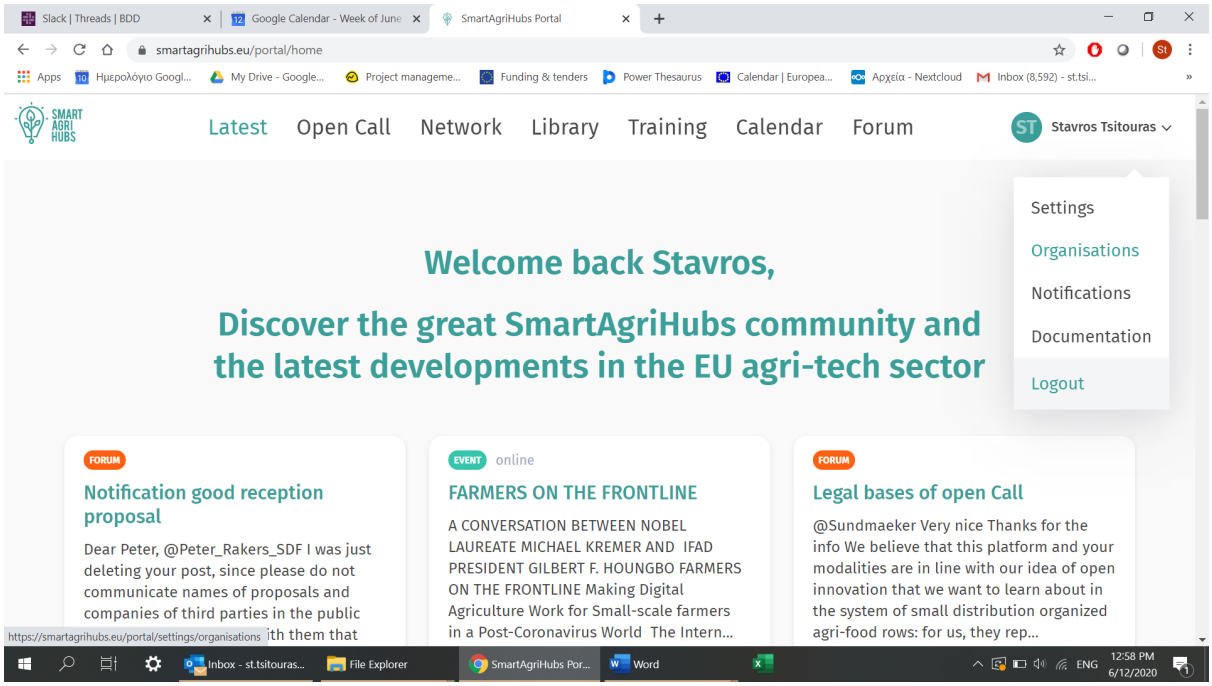
APPENDIX I: TESTING INSTRUCTIONS

SmartAgriHubs Innovation Services Maturity Model (ISMM) Guidelines:

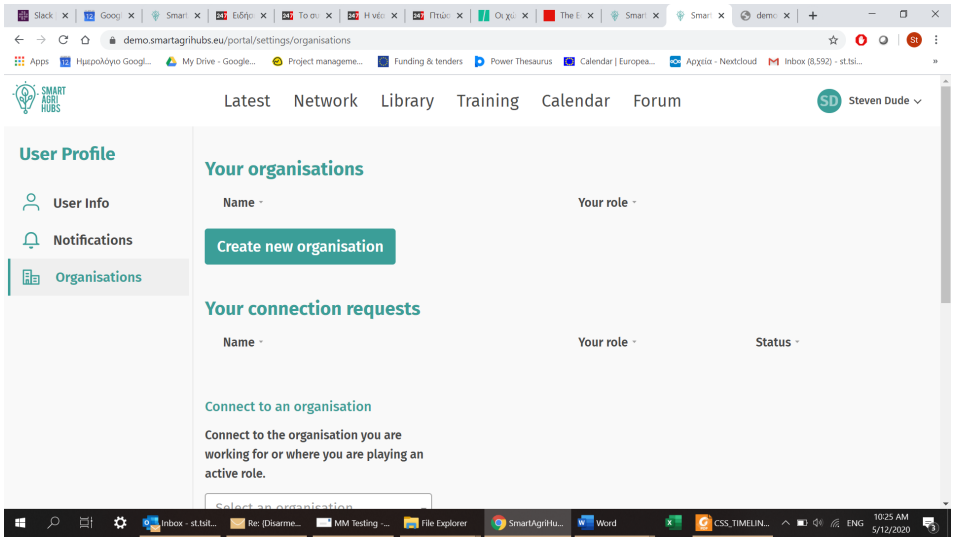
The following document contains practical information on how to start using the ISMM.

1. Create an account on the SAHs page:
https://smartagrihubs.eu/login
Verify your account through your e-mail
Log-in

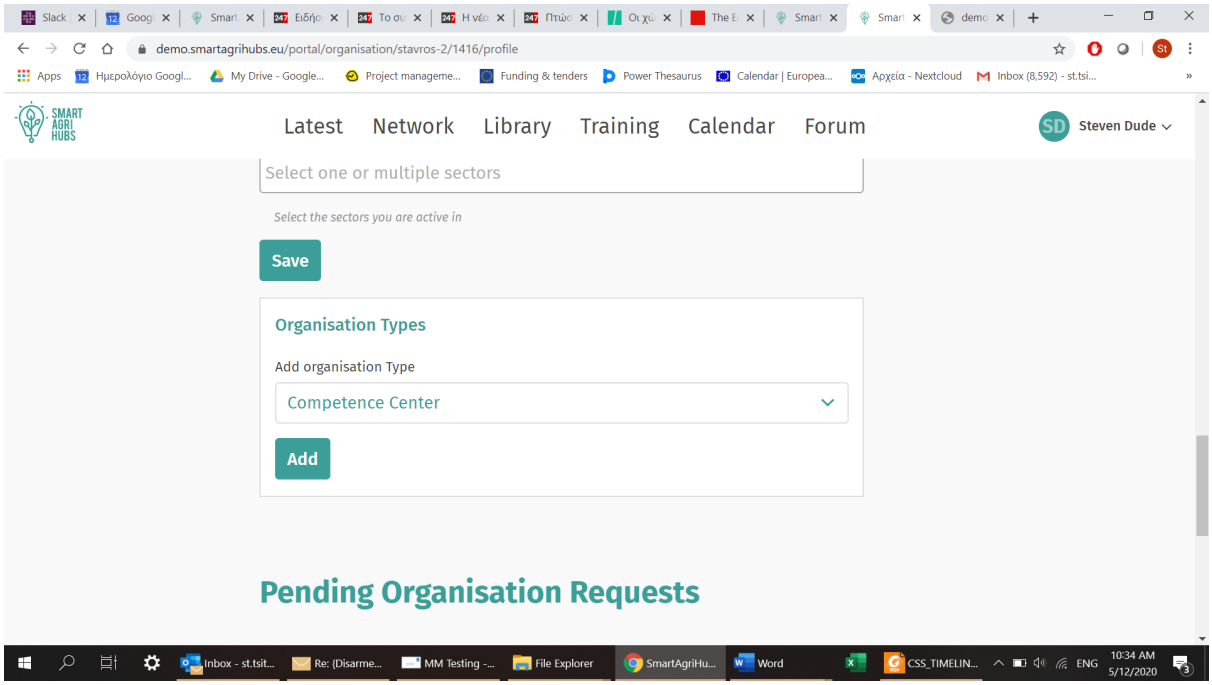
2. On the right corner of the site, click on your name and choose Organizations



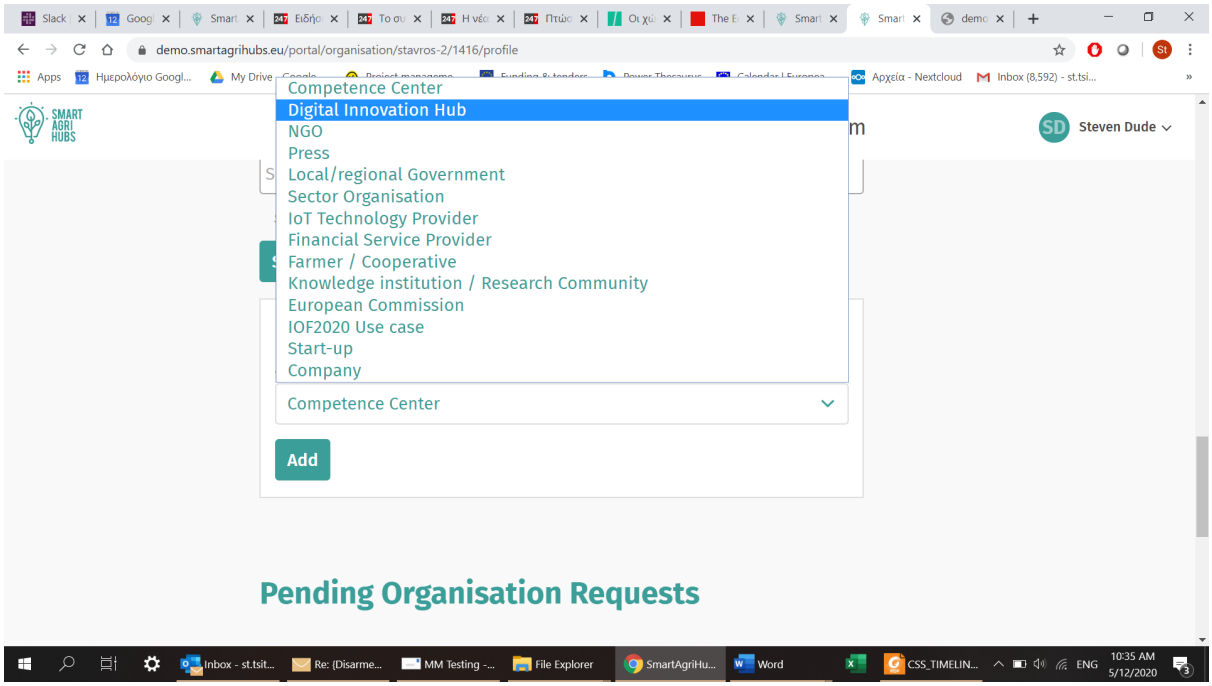
3. In case your DIH is NOT already registered choose: Create new organization (In case you have already registered your DIH, go to step No 7)



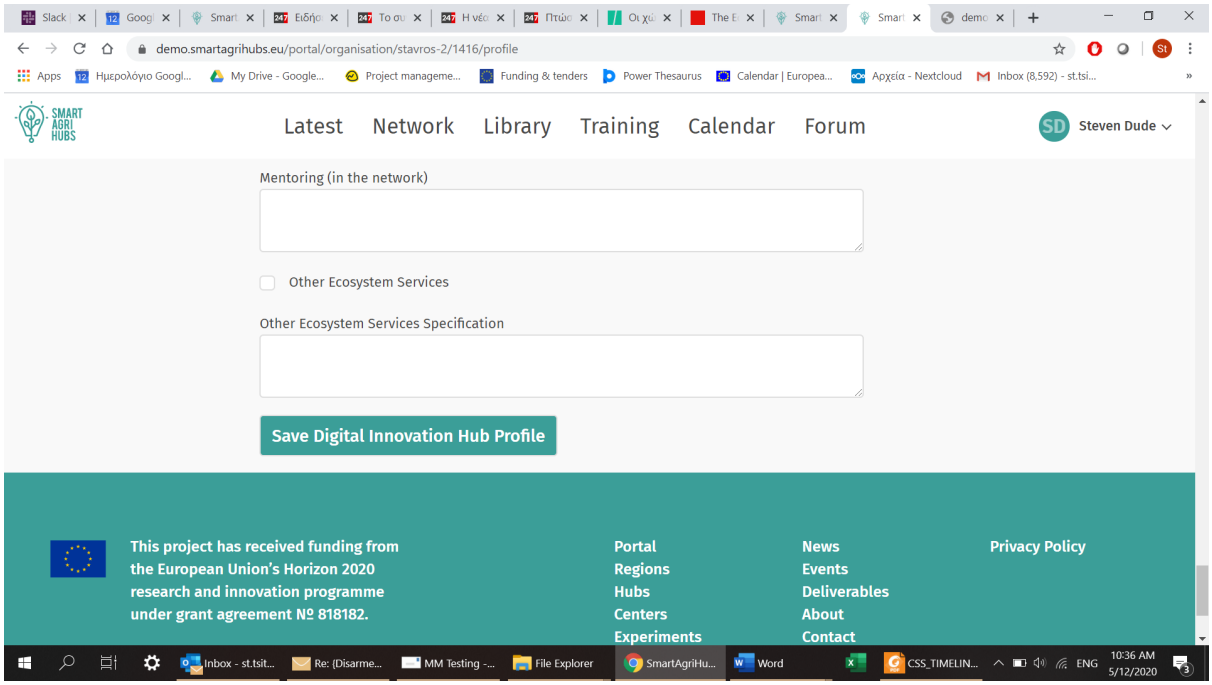
4. After you create the organization click on it; scroll down on the page where organization type appears



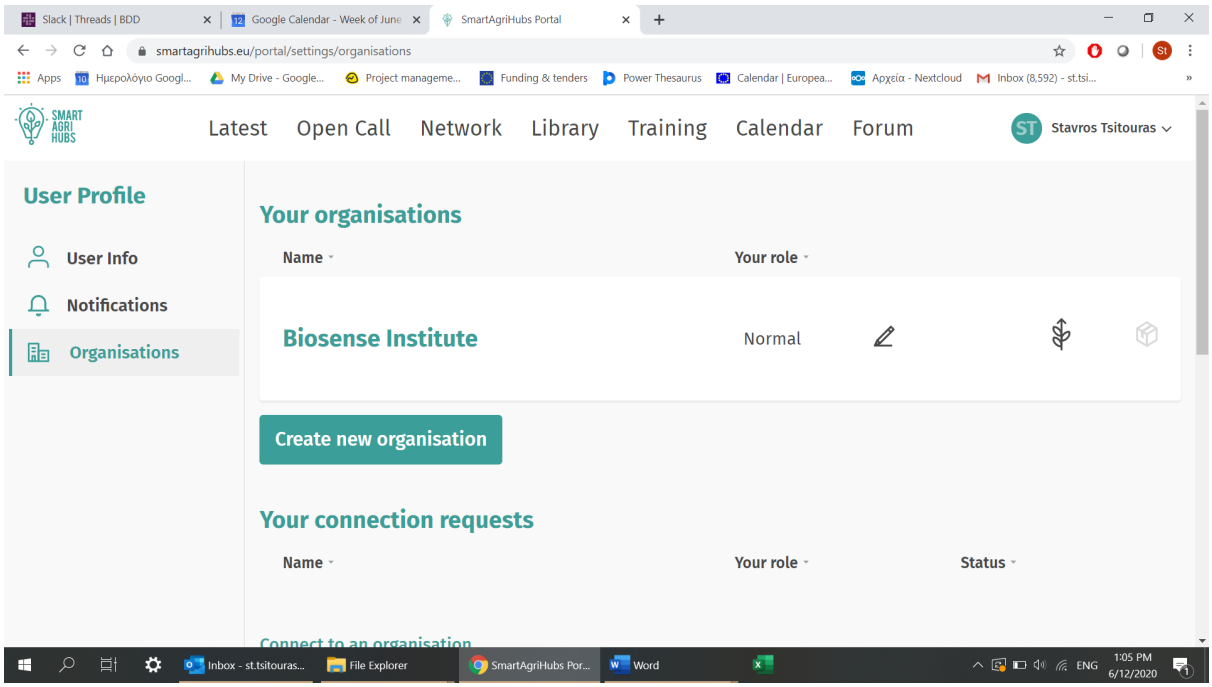
5. You choose Digital Innovation Hub and press add



6. Then Save Digital Innovation Hub Profile



7. Back to the Organizations Page you press the last symbol  and you are ready to start



APPENDIX II: USER EVALUATION FORM

MATURITY ASSESSMENT TOOL

Friendly user test

Name: Test date:

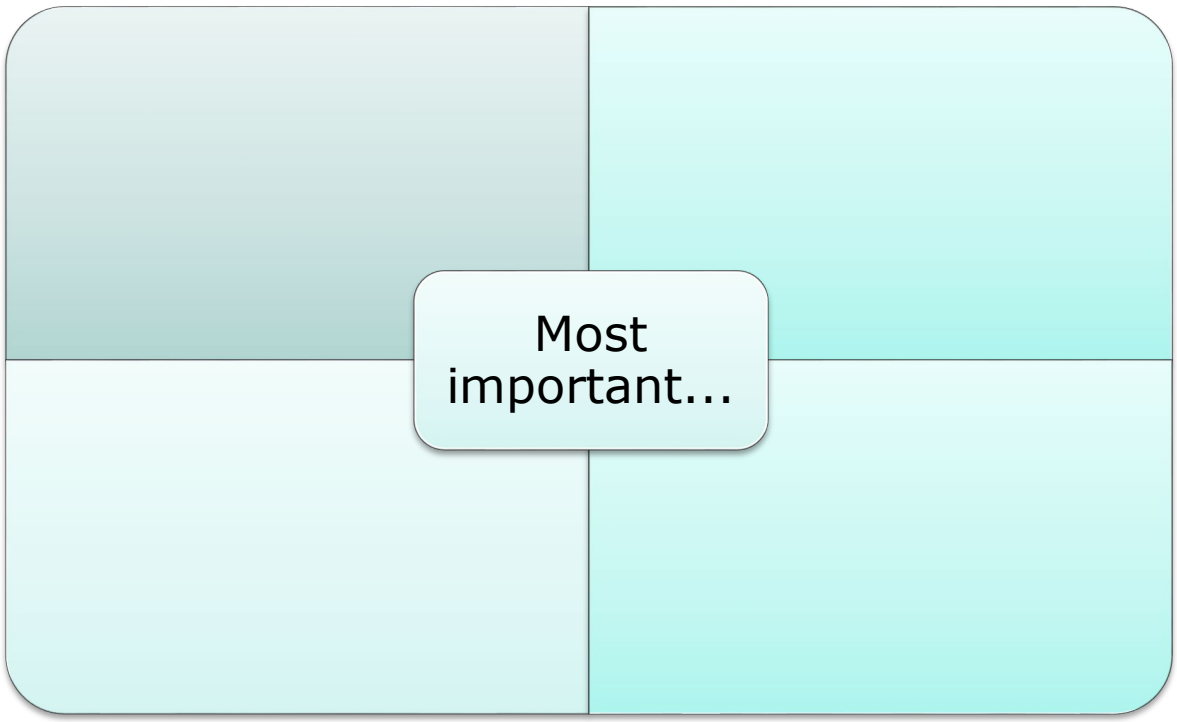
NB: this test deals with the user experience of the tool itself. For comments on the content of the tool, you are welcome to contact us via Stavros Tsitouras at st.tsitouras@gmail.com

Please fill in the table below. There are also open spaces for your own feedback points. In the '+++' and '---' column you can mark your positive or negative experience and add an explanation

Part of the tool	**My opinion about…**	**+++**	**---**
Introductory part	The goal of the tool		
	The clarity of how to start		
	Feeling personally addressed		
	Feeling motivated to do the assessment		
	Other…		
Flow of the tool	Ease of use of the tool		
	Feeling guided through the flow		
	The display of the content		
	The length of the tool		
	Other…		

Assessment result	The promptness with which I get my results		
	Seeing my assessment results in one glance		
	Understanding my assessment results		
	The actionability of my assessment results		
	Whether I would advise others to do the assessment		
	Other…		

Lastly, could you sum up your main like, dislike, question and/or tip for us regarding the Maturity Assessment Tool?



Thanks!

APPENDIX III: FINALISATION ISSUES

Technical and UX issues

A/A	Issue	Solution	Stage for improvement (N=Now L=Later)	Person Commented
1	Confirmation of new account is received into Junk mail, please refer to that too. During the creation of a new organization some fields have to be completed but are not shown. Tool only allows to save once you enter additional (non requested) data.			B
2	Try to fix the labels, it looks weird. (see picture)			B
3	Table of content should always be visible and once you go into services it feels like the questions just keep coming, might be resolved in a progress tracker or table of content overview.			B
4	The display of the content: Again, too much text. This is not helpful. Use alternative widgets available in market research context.	Use alternative widgets available in market research context.	N	
5	Entering a “my Note” is not intuitive (it is not click, but hoover click)			M
6	a “My Note” is not saved if you do not click next step. So, if you make a not, then click another item your note is lost.			M
7	At the “Service part” it is unclear where the Maturity level is referring to o To Community building as a whole o Or to 1 of the specific activities o Or to the newly added service			M
8	When filling in the maturity for the services, the page is so long, that you don’t see the services/activities anymore			M
9	Unclear what happens with the new Activities o I added everywhere a new activity, but don see them again			M
10	I miss a “download button”			M
11	Can it be saved for versioning (to see improvement over time?)			M
12	Maturity levels per service / Maturity levels per Pillar: It is not 100% visible what the results refer to	In these 2 results categories, is it possible to have the overall result in Bold and maybe have the row in a different color so that it is obvious that they are the overall results		S
13	Terms of Use/Agreement	Need I acceptt button		S

14	1. Simplify the presentation of the long texts of the maturity levels. a. Bart is very aware of all the services and knows pretty well how well he's doing. He also 'sees through' that the levels are more or less the same logic for each service. So, he's a bit bothered with the lengthy texts. b. E.g. by pop-up c. Or combination of level-name + text d. Switch (hide/show) e. Tabularized approach? f. Other, suggestion by GUI experts	B /F
15	4. Provide more than the spider diagram in the end a. E.g. ask which services require improvement according to the DIH b. E.g. present current and next best level descriptions for these services c. Provide access to learning materials and 'better' peers at that service d. Invite the DIH to propose improvement steps	B /F
16	2. I cannot observe which sections I have done	F
17	1. The portal does not save responses, or load them when I logout and re-enter, so I cannot continue if I stop at some point.	F
18	2. I cannot observe which sections I have done	F
19	3. I cannot go back	F
20	4. I can go forward without answering	F
21	5. On the 'per service' pages, I would like to hide the activity descriptions, and also the non-chosen levels	F
22	6. We need to be able to download a pdf for inclusion in the proposal submission	F
23	7. Overall, the flow can be followed reasonably well, but sometimes I wonder where I am in the flow. I just wonder if this provides the optimal user experience.	F
24	**Results presentation**	F
25	1. Indicate the services categories	F
26	2. Show also, perhaps greyed-out, the 'skipped' services.	F
27	a. In the tables, and also in the spider diagram. This is to maintain a complete picture and 'remind' the DIH that these are also there.	F
28	b. But it should not weigh for averages!	F
29	3. I prefer to have the service maturity and the pillars as columns, such that I can also directly see variation in e.g. process over the services	F
30	4. The TRL levels should be more condensed	F
31	5. The TRL level section could be positioned below in a 'DIH Profile section'	F

Conceptual issues

Issue	Solution	Category	Stage for improvement (N=Now L=Later)	Person Commented
the goal of the tool itself is clear to me, however I don't understand how the tool itself contributes to that goal.	Provide clearer instructions of the usability/ better results interpretation	Texts		B
NOT Feeling personally addressed	Better Intro Texts	Texts		B
30 minutes feels long. Hoping to get some interesting feedback. *afterwards: Given the process and results I don't feel motivated to follow the suggestions to complete this tool once or twice per year.	Provide clearer instructions of the usability/ better results interpretation	Texts		B
The amount of text makes it very demotivating to deal with. Especially the maturity levels should be on a scale of 1-5 instead of the massive amount of text (which will not be read). Idem for the follow up questions (I II III). 1-5 will make it more appealing and will motivate the user more to continue. The text can be provided as clarification via an information button or something	Replace the Maturity Level Descriptions with 1 to 5 (ad-hoc to excellent) - Provide the levels description only at the beginning and have them somewhere handy in case needed by the respondent	UX		B
Too long and too much text. A tool should be practical, this feels like a manual on DIH services, with questions aimed to be vague in order to address all possibilities, not connected to "my" DIH. Also, a very repetitive process to answer the questions regarding personnel and finances, high chance of quick random selection instead of actually focusing.	Reduce Texts	UX		B
The actionability of my assessment results: I see a spider diagram, but no advice, no recommendations. How should this be actionable? This just confirms what I already know. It gives me the feeling: 'is this it?' and 'why did I complete this questionnaire?'	Provide clearer instructions of the usability/ better results interpretation	Texts		B
Ask a DIH about its size. How many people are working in the DIH, providing those services? And take this into account. Moreover, the definition of what the tool describes as mature is confusing to say the least.	Reduce Texts	Texts/UX		B
Lot of plaintext. Hard to read. Do some mark up: bold for important parts Made almost at every webpage such a comment	Check Texts and fix accordingly	Texts/UX		M
But it is a lot of work/reading to do the assessment (needs a lot of concentration).	Reduce Texts/ Fix Results	Texts/UX		M
Understand up front how the results should be used. E.g. link with review, improvement plan, best practice, learning material, community	Provide clearer instructions of the usability/ better results interpretation	Texts		B/ F

3. And understand up front that all of this is not all available, but that gathering data for benchmarking is nevertheless relevant now	Provide clearer instructions of the usability/ better results interpretation	Texts	B/ F
Guidance			
1. The introduction needs a small paragraph on what the maturity assessment actually is. Stg like it is a survey of XXX questions about your DIH and specifically on the Innovation Services.	Provide clearer instructions of the usability/ better results interpretation	Texts	F
2. Also a brief explanation on what a maturity level is	Provide clearer instructions of the usability/ better results interpretation	Texts	F
3. And that it is not necessary or 'good' to have an 'excellent' level for all services. This is for the DIH to decide.	?		F
4. That the maturity levels in the exercise are ordered from ad-hoc to excellent	Provide Explanation,		F
5. Introduction of the pillars	An introduction for each session	Texts	F
6. Introduction of the flow: generic and then per service and then results	An introduction for each session (Be careful to have nice UX - We already have too many text)	Texts	F
7. Explanation of the 'per service page': activities; maturity; pillars	An introduction for each session	Texts	F
8. Explain in the introduction as well as on the 'per service' pages that the activities section is only for support of the DIH and its stakeholders – to be concrete/specific, but it is not assessed.	An introduction for each session	Texts	F
9. Some things need clarification, e.g. 'technology field' and other generic dimensions, e.g. 'paying member'	Provide Explanation	Texts	F
10. A link to the D4.2 deliverable	?		F
Wordings			
1. In the introduction, the line with 'Overall Scope:' can be deleted	Changes in Text	Texts	F
2. Getting started ← 'Get started'	Changes in Text	Texts	F
3. The DIH does not have a business and/or sustainability plan, such as a financial prognosis of income/expenses. ← financial sustainability	Changes in Text	Texts	F
4. What are paying members?	Provide Explanation	Texts	F
5. In the left column replace 'General' with 'General DIH Maturity' for consistency. In general check page names with left column reference for consistency also in capitals etc.	Changes in Text	Texts	F
6. Results page 'Final DIH maturity' → 'Overall DIH Maturity'	Changes in Text	Texts	F
7. How many customers / paying members does your DIH has? → have? ← What is a paying member?	Provide Explanation	Texts	F
CONECTION WITH THE OPEN CALLS	**HOW - WHEN - TEXTS - TECHNICAL**		**ALL**

Feeling motivated to do the assessment: It is important to indicate that the tool should be used every six months. Or with a significant development of the number of partners and/or services.	Provide clearer instructions of the usability/ better results interpretation	L