D4.8

Innovation management assessment and revision

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[1] Acronyms are marked in purple in the text and defined at the end of the document.

1. Executive Summary

The INTERSECT project aims at driving the uptake of materials modelling software in industry, bridging the gap between academic innovation and industrial novel production, with the goal of accelerating the process of materials selection and device design and deployment. The Innovation Management (IM) task (T4.4) is explicitly conceived to monitor the market needs and the technical evolutions throughout the project lifetime, and to plan an exploitation strategy after its end. One main purpose of the IM is to constantly refine the project work plan to meet the market and partner institutions (including academic, R&D institutes, EU infrastructures) needs with state-of-the-art technological solutions.

The scope of this deliverable is to assess and revise the innovation framework and roadmap defined in the submitted D4.5 "Innovation Management Plan". Moreover, the results of the mapping, scouting, assessment, and exploitation phases are described. The resulting "innovation products" constitute the foundation of the revised business plan reported in deliverable D4.7.

The Interoperable Material-to-Device (IM2D) platform is the main INTERSECT outcome. The realization of this goal required the development of other tools, instrumental to the IM2D platform development. After the IM process described below, six of these instrumental features have been identified as additional key exploitable results that can be exploited independently from the final IM2D product.

The IM activities are managed by AMAT, in close collaboration with the Project Coordinator (CNR), the Work Package (WP) leaders, and will be shared with the Advisory and Exploitation Board (AEB).

The rest of the document is organized as follows:

- Section 2 – Innovation framework assessment focused on the mapping, scouting, assessment, and exploitation phases.
- Section 3 – IM status and results. Analysis and results of the mapping, scouting, assessment and exploitation phases.
- Section 4 – Conclusion summarizes the main outcomes of this deliverable.

1.1 About this document

The "Innovation Management assessment and revision" document (Deliverable 4.8) is prepared under T4.4. "Innovation Management" of WP4 – Exploitation, dissemination & communication. This deliverable assesses and revises the IM framework and assumptions described in D4.5 "Innovation Management Plan" released at M19.

2. Innovation Framework Assessment

As described in detail in D4.5, the INTERSECT Innovation framework is a multi-step approach based on four phases: **mapping, scouting, assessment,** and **exploitation**, as shown in Figure 1.

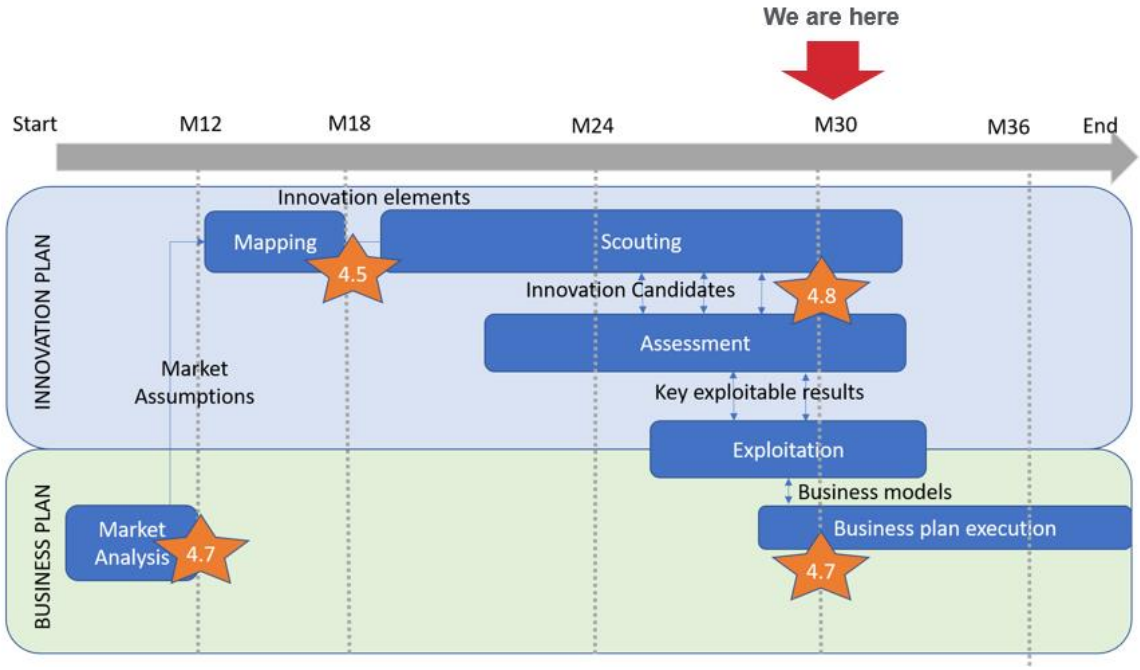

Figure 1. Innovation plan. Stars indicate the number and time of the main deliverables.

2.1 Mapping phase

As a result of the D4.5, the Innovation Manager, in cooperation with the Project Coordinator, has created a list and classification of the INTERSECT deliverables in terms of their innovation potential. In this document, we compare the expected innovation flow based on the INTERSECT deliverables with the list of innovation candidates identified during the Scouting phase by using the same methodologies.

Objective:	Mapping INTERSECT deliverables with innovation potential			
Input	INTERSECT project			
Actors	Responsible	Accountable	Consulted	Informed
	Innovation Manager	Project Coordinator	AEB	WP leaders
Actions	- Identification of INTERSECT deliverables with innovation potential - Classification of the deliverables using the following criteria: ○ TRL – Technology Readiness Level			

	○ MRL – Market Readiness Level - Define the innovation path framework using the SGM approach - Define the risk level with the Risk Matrix - Create an IP register
Outputs	Innovation framework List of key innovation elements IP Register

Table 1. Mapping phase.

2.2 Scouting phase

A rolling activity driven by an innovation roadmap and led by the Project Coordinator in cooperation with the WP leaders and the Innovation Manager has been carried out to identify the list of the innovation candidates. The Innovation Manager collected and analysed the innovation candidates proposed by the WP leaders. This involved: i) the information on the project results classified by using the EU *Innovation Radar Survey*; ii) the background and foreground Intellectual Property (IP) identification and inclusion in the IP register.

Objective:	Capturing information and innovation profiling related to the INTERSECT results			
Input:	INTERSECT key innovation elements			
Actors	Responsible	Accountable	Consulted	Informed
	Project Coordinator	Innovation Manager	WP leaders	AEB
Actions	- Collection of data and information on INTERSECT project key results - IP information collection: ○ Identifying of background IPs ○ Identifying foreground IPs - Innovation profiling: ○ Innovation Radar Survey Application to capture innovation data and information			
Outputs	List of innovation candidates IP register updating			

Table 2. Scouting phase.

2.3 Assessment Phase

The list of innovation candidates identified during the Scouting phase has been analysed and ranked by the Innovation Manager in order to select the key INTERSECT's exploitable results.

Starting from scoring the results of the *Innovation Radar Survey*, the innovation candidates have been ranked by a set of indicators, namely the *Innovation Readiness Indicator* (IRI), the *Innovation Management Indicator* (IMI), and the *Market Potential Indicator* (MPI).

In the original Innovation Plan (D4.5), we proposed to use the Real-Win-Worth (R-W-W) approach as screening method to select the best innovation candidates. During the analysis, we have realized that this approach would not fully fit the scope of our project. Indeed, the R-W-W is a business method for Sales Opportunity Analysis, that allows for effective management of multiple project sale opportunities by ensuring to invest time and resources in the right solutions. On the other hand, as explicitly stated in the Description of the Action (DoA), the aim of INTERSECT is to develop results at a "pre-competitive" level (i.e., not for sales). Therefore, we adopted an alternative approach, and we evaluated the innovations using the EU guidelines [1] for the maturity level evaluation (described in ANNEX1). The Innovation Maturity Model (IMM) better describes the pre-competitive status of each key exploitable result during the development phase. The IMM is based on the Innovation Radar Survey analysis and allows us to evaluate the IMI and MPI scores of our innovation candidates. Finally, the list of exploitable results has been classified by the resulting *Innovation Potential Indicator* (IPI).

Objective:	Analyze and rank the INTERSECT innovations to select the key exploitable results			
Input:	List of potential innovation results and framework			
Actors	Responsible	Accountable	Consulted	Informed
	Innovation Manager	AEB	Project coordinator	WP leaders
Actions	Assessment focus sessions to rank and evaluate framework to rank innovation potential from the standpoint: - Innovation readiness (IR) - Innovation management - Market potential - Selection of key exploitable results			
Outputs	List of key exploitable results			

Table 3. Assessment phase.

2.4 Exploitation Phase

During the ongoing exploitation process, the Innovation Manager has analysed and selected the best **business model** to maximize the impact of the innovations with respect to the market segment. In this deliverable, a pool of business models will be described and associated with the exploitable results. The Business model canvas and the Market analysis, assumptions and trends are covered in the "Business Plan revision" (D4.7, M31).

Objective:	Identify the business model to develop the Business Plan			
Input:	List of key exploitable results			
Actors	Responsible	Accountable	Consulted	Informed
	Innovation Manager	AEB	Project coordinator	WP leaders
Actions	- Brainstorming the innovation Business Models focused on formulating value propositions, branding, and market segmentation - Identification of the best Business Models to exploit the innovation results - Identification of the "Go to market" needs of high potential innovations; - Align and validate new Business Models with industrial relevant partners.			
Outputs	Business model definition			

Table 4. Exploitation phase.

3. Innovation Management Status and Results

3.1 Scouting activity status

Following the innovation framework, the WP Leaders, led by the Project Coordinator, collected all the innovation-relevant information by using the *EU Innovation Radar Questionnaire* during the project execution (see ANNEX 1) [1]. As a result of the Scouting phase, we collected the following list of innovation candidates (Table 5), indexed by the most relevant WP.

WP	Innovation candidates	Type	Description
All	IM2D platform	Software	IM2D is a multi-physics, multi-model, multi-equation, hierarchical, and scale-reversible model for material-to-device and device-to-material optimization for an easier exploration of the material workspace from an electronic device-oriented industrial perspective.
1	Ontology domain	RDF-data	Domain ontology to describe all the relevant representational primitives. It includes information about their meaning and constraints on their logically consistent application.
2	Semantic wrappers	Software	Semantic interfaces (wrappers) between simulation tools and OSP-core. Wrappers are the backbone of the interoperability enabling data sharing and transfer among applications.

	Properties workflows	Software	Specific workflows for advanced "on-demand" materials properties (e.g., structural import data and relaxation, band structure calculation, determination of defect formation energy, computation of dielectric constants, and more).
	Ginestra-AiiDA interface	Software	The Ginestra-AiiDA plugin allows the exchange of European Materials Modelling Ontology (EMMO) compliant data from/to the AiiDA database in both the M2D and D2M workflows. For the M2D workflow, it is possible to retrieve/import a crystalline structure, retrieve a physical property, or submit/monitor the property computation. In the case of the D2M, the interface queries the AiiDA database via the REST-API looking for materials that match the first block outputs of the first block.
	AiiDA-QE interface	Software	The AiiDA-QE interface offers the possibility to access and automatically control the execution of complex quantum mechanical calculations performed with the QE suite.
	AiiDA-SIESTA interface	Software	The AiiDA-SIESTA plugin has been designed to run the most general SIESTA calculations, with support for most of the available options (limited by corresponding support in the parser).
3	Analysis of complex systems	Software/ service	Post-processing simulation tools for the analysis of structural and electronic properties of disordered systems from Molecular Dynamics and ab initio simulations for material discovering and material characterization.

Table 5. List of innovation candidates.

The IP register has been updated accordingly (see Table 6).

WP	Innovation candidates	Background IP			Fore ground IP		
		Name	Owner	Type of Protection	Name	Owner & Beneficiaries	Type of Protection
1	Ontology domain	EMMO ontology	See https://github.com/emmo-repo/EMMO	Creative Commons CC BY 4.0	IM2D toolbox application ontology	IWM + use case partners as domain experts	Creative Commons CC BY 4.0
2	Semantic interfaces (wrappers) between simulation tools and OSP-core	SimPhoNy OSP core	IWM + other, see https://github.com/simphony	BSD 3-Clause	IM2S SimPhoNy OSP-wrapper	IWM	BSD 3-Clause
	Properties workflows	AiiDA-Core	See https://www.aiida.net/	MIT open source		EPFL, CNR, ICN2	
		AiiDA framework + AiiDA-SIESTA plugin + flos scripting package	AiiDA: EPFL; AiiDA-SIESTA: see https://github.com/siesta-project/aiida_siesta_plugin/LICENSE.txt; FLOS: "The SIESTA group" (see:	MIT license (all three)	Basic materials workflows + advanced workflows (Defects, NEB transition-barrier search)	EPFL, CNR, ICN2+CSIC	MIT

			https://github.com/siesta-project/flos)				
	Ginestra-AiiDA interface	Ginestra™ proprietary software	Applied Materials Inc	Copyright	GUI interface for AiiDA Ginestra Plugin	AMAT	Copyright by AMAT
		AiiDA-Core	See https://www.aiida.net/	MIT open source	AiiDA-POST	EPFL	MIT open source
	AiiDA-QE interface	AiiDA-Core	see https://www.aiida.net/	MIT open source		EPFL	MIT open source
	AiiDA-SIESTA interface	AiiDA-Core	see https://www.aiida.net/	MIT open source		ICN2	MIT open source
		AiiDA framework + AiiDA-SIESTA plugin @start of project	AIIDA: EPFL; AiiDA-SIESTA: see https://github.com/siesta-project/aiida_siesta_plugin/LICENSE.txt	MIT license	Further functionalities in plugin (including Lua support) and general-purpose workflows	EPFL, ICN2+CSIC	
3	Analysis of complex systems	BELLO	CNR	Open source		CNR	

Table 6. IP Register.

3.2 Mapping activity status

As described in the previous chapter, we revised the D4.5 INTERSECT *Innovation Roadmap* by considering the list of innovation candidates. The Innovation Manager, in cooperation with the Project Coordinator, assessed the Innovation framework assumptions based on the deliverable D4.5 with the list of the innovation candidates defined during the Scouting phase.

First, we linked the deliverables to the innovation candidates (Table 7):

WP	Innovation	Linked Deliverables
All	IM2D platform	D1.5 GUI design and setup D3.3 First report on IM2D box evaluation through user feedback based on the Figures of Merit D2.4 Materials-to-device and device-to-materials syntactic interconnections D1.6 GUI deployment D3.4 Impact of stable defect configurations on performances and scaling of HfO2-based FE- devices D3.5 Impact of stable defect configurations on the electrical performances of Ovonic Threshold Switching (OTS) selectors D3.6 Second report on IM2D box evaluation
1	Ontology domain	D1.1 Report on use cases and system requirements D1.3 Report on INTERSECT developed ontologies and MODA
2	Semantic wrappers	D2.5 Semantic interoperability of the automated workflows through SimPhoNy
	Properties workflows	D3.1 Atomic defect properties extracted from the electrical measurements on FE-HfO2-device D3.2 Atomic defect properties extracted from the electrical measurements on OTS selectors D2.3 QE and SIESTA workflows for advanced materials parameters
	Ginestra-AiiDA interface	D2.1 Plugins for code interoperability D2.8 Realization of Ginestra™ data section on Material Cloud
	AiiDA-QE interface	D2.1 Plugins for code interoperability

		D2.3 QE and SIESTA workflows for advanced materials parameters
	AiiDA-SIESTA interface	D2.1 Plugins for code interoperability D2.3 QE and SIESTA workflows for advanced materials parameters
3	Analysis of complex systems	D 3.4 Impact of stable defect configurations on performances and scaling of HfO2-based FE- devices D3.5 Impact of stable defect configurations on the electrical performances of OTS selectors

Table 7. Connections between innovation candidates and project deliverables.

Then, we performed the innovation assessment using the same criteria adopted in D4.3:

- The *Technology Readiness Level* (TRL) vs. the Market *Readiness Level* (MRL) (see D4.3 Annex-1 for further details).
- The innovation *Risk Matrix* (see D 4.3 Annex-1 for further details).

Finally, we controlled the INTERSECT *innovation roadmap* status adopting the *Stage Gate Model* (SGM) approach (see D 4.3 Annex-1 for further details).

3.2.1 Technology Readiness Level (TRL) vs the Market Readiness Level (MRL)

In Table 8, we ranked the Innovation candidates based on the combination of the TRL and MRL.

WP	Innovation	Type	TRL	MRL
All	IM2D platform	Software	7	4
2	Ginestra-AiiDA interface	Software	7	4
2	Properties workflows	Software	6	3
3	Analysis of complex systems	Software/ service	6	3
2	Semantic wrappers	Software	6	3
2	AiiDA-QE interface	Software	6	2
2	AiiDA-SIESTA interface	Software	6	2
1	Ontology domain	RDF-data	5	2

Table 8. TRL and MRL attribution to innovation candidates.

Figure 2 describes the status of the Innovation roadmap starting from the scenario depicted in D4.3 (based on the INTERSECT deliverable profiles), and proceeding with the actual innovation situation (based on the innovation candidate profiles).

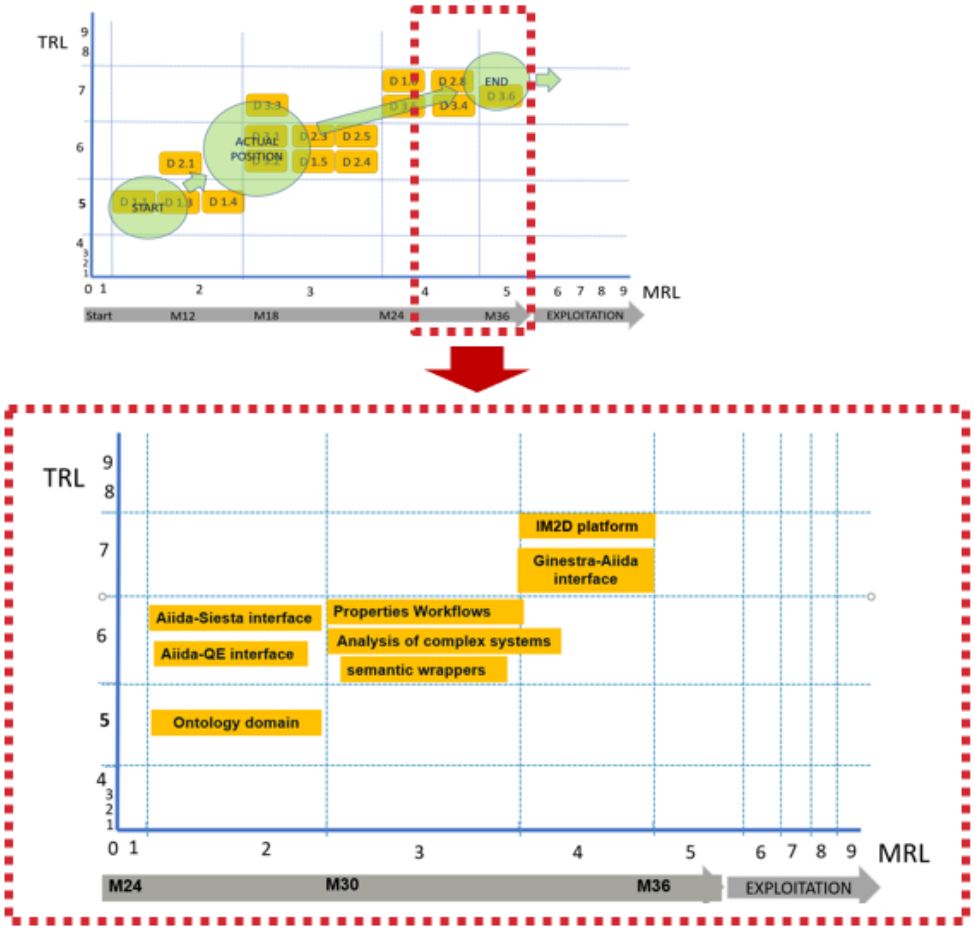

Figure 2. TRL – MRL grid. D4.5 vs. current situation.

The IM2D platform is in line with the expected innovation roadmap. During the Project further innovation has been generated, such as the property workflow, the semantic wrappers, and the plugins. In general, they are aligned with their corresponding deliverables. On the basis of this classification, IM2D and the Ginestra-AiiDA interface are the most promising innovation candidates.

3.2.2 Innovation risk matrix

Along the lines of D4.5, we asked the team members to estimate the risk of each innovation candidate. The results are summarized in the innovation matrix reported below (Figure 3). The innovation matrix is also related to the project risk matrix assessed in deliverable D5.2. In D5.2 the risk is related to the product/technology development of the overall INTERSECT project, which corresponds to the y-axis in the Innovation risk matrix.

Comparing the risk scenarios from D4.5 to D4.8, we concluded that, as for the deliverable case, most of the innovation candidates have a medium failure probability (45% - 75%), only the

complete IM2D platform overcomes this failure risk (>75%). In the current scenario, the majority of innovations are still under development, while a few (such as the interfaces and the wrappers) are developed and tested. This justifies the position of the product/technology on top of the y-axis. Regarding the intended market, the innovations are less mature. The results are not yet exploited, since the business model and the potential market are still under evaluation. This increases the uncertainty and the probability of failure. As an example, AiiDA-Ginestra, AiiDA-SIESTA and AiiDA-QE interfaces are identified as a low risk in the project execution (ref. Foreseen risk table in D5.2, risk #R4). In the innovation risk matrix, all these are identified as medium risk (45% - 75%) because they are not still validated in the industrial environment and their market positioning is not defined yet. In the IM2D case, both the risk matrices (project D4.5, #R1-R2 and innovation D4.8) identify the platform as high risk and high probability of failure.

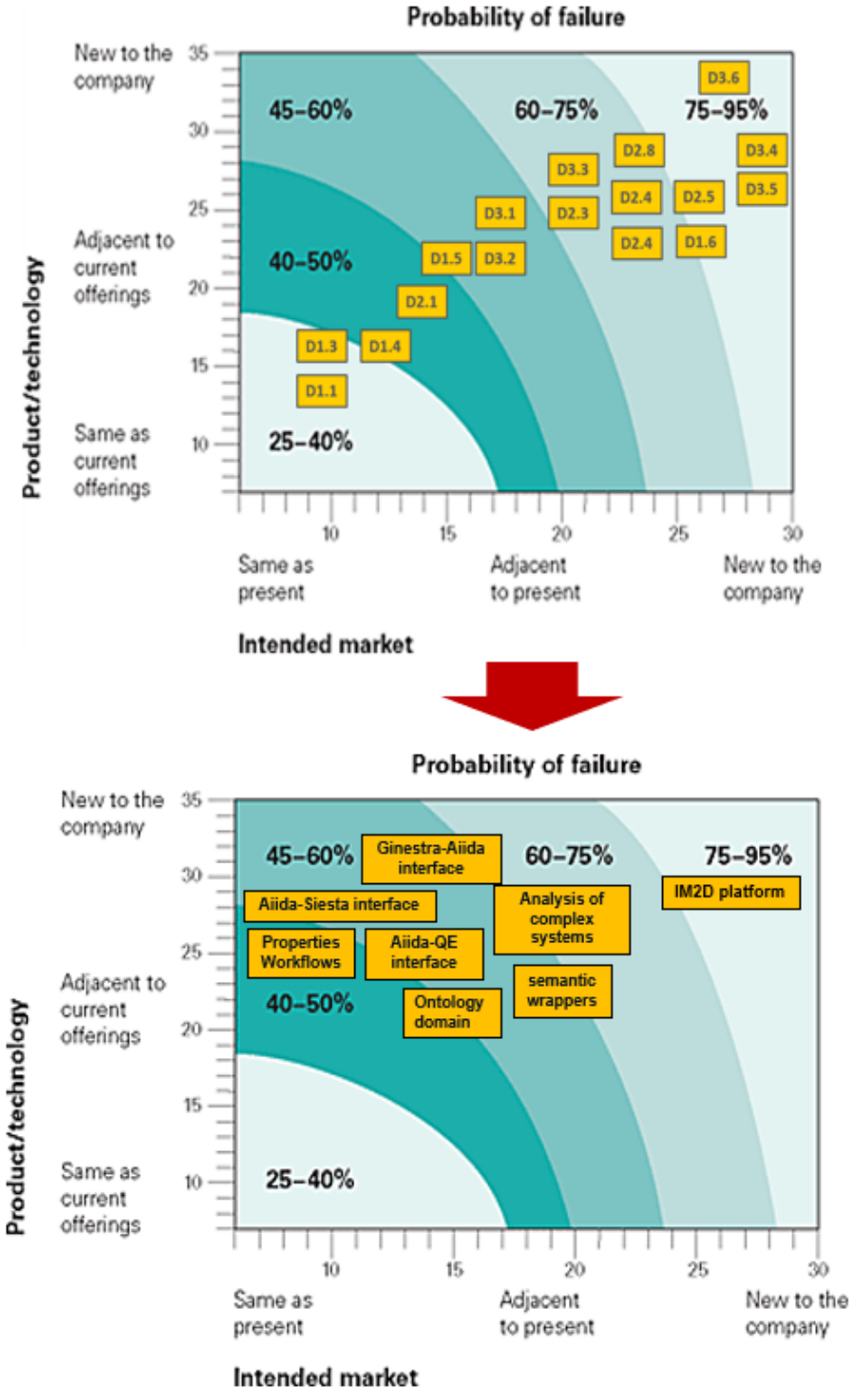

Figure 3. Innovation Risk Matrix. D4.5 vs. current situation.

3.2.3 Stage Gate Model (SGM)

Following the Stage Gate model approach, we assessed the innovation roadmap described in D4.5 as shown in Table 9 and Figure 4). In the current stage, we are respecting the innovation roadmap.

- "Ontology domain", "Semantic wrappers", and "Analysis of complex systems" are positioned at **Stage 3 – Development**, since they are still under development.
- The interfaces (AiiDA-QE, Ginestra-AiiDA, AiiDA-SIESTA), the properties workflows and the IM2D platform are at **Stage 4 - Testing and validation**. In this phase, they are in an advanced development phase and under testing. In the case of IM2D, the validation results will be described in D3.6 "Second report on IM2D box evaluation" (M36).
- We do not expect to reach the **launch phase** for the IM2D platform within the end of the project.

#	WP	Innovation	Stage Gate
1	All	IM2D platform	Stage 4 – Testing and Validation
2	2	Ginestra-AiiDA interface	Stage 4 –Testing and Validation
3	2	AiiDA-QE interface	Stage 4 – Testing and Validation
4	2	AiiDA-SIESTA interface	Stage 4 – Testing and Validation
5	2	Properties workflows	Stage 3 – Testing and Validation
6	3	Analysis of complex systems	Stage 3 – Development
7	2	Semantic wrappers	Stage 3 – Development
8	1	Ontology domain	Stage 3 – Development

Table 9. Stage gate status of the innovation candidates.

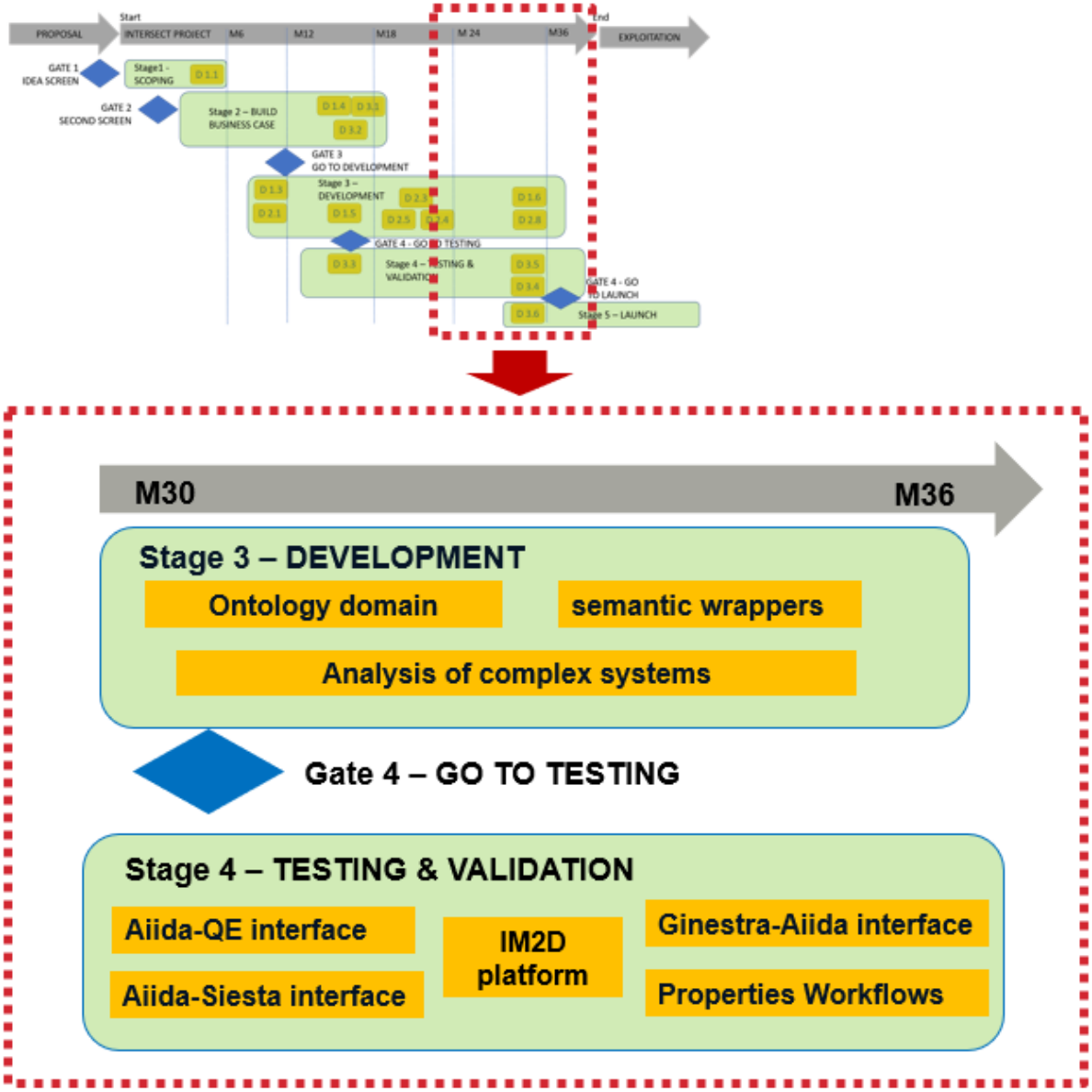

Figure 4. Stage Gate Model. D4.5 vs. current situation.

3.2.4 Innovation candidates list

As an entry point of the Assessment phase, we collected the mapping and scouting outputs. Table 10 summarizes the list of *innovation candidates* with their main attributes and a tentative ranking.

Rank	WP	Innovation	TRL	MRL	Risk	SGM
1	All	IM2D platform	7	4	High	Stage 4 – Testing and Validation
2	2	Ginestra-AiiDA interface	7	4	Medium/ High	Stage 4 – Testing and Validation
3	2	AiiDA-QE interface	6	2	Medium	Stage 4 – Testing and Validation
4	2	AiiDA-SIESTA interface	6	2	Medium	Stage 4 – Testing and Validation
5	2	Properties workflows	6	3	Low/ Medium	Stage 4 – Testing and Validation
6	3	Analysis of complex systems	6	3	Medium/ High	Stage 3 – Development
7	2	Semantic wrappers	6	3	Medium	Stage 3 – Development
8	1	Ontology domain	5	2	Medium	Stage 3 – Development

Table 10. Results of the Mapping and Scouting phases related to the innovation candidates.

3.3 Assessment activity status

The table above represents the input for the Assessment phase. Adopting the Innovation readiness, Innovation management and Market potential indicators, the list of *innovation candidates* has been evaluated and ranked by the Innovation Manager. The score table results are reported in ANNEX 1. In this section we graphically report the results of the survey. The innovation candidates with a high rank of innovation potential have been qualified as key exploitable results and moved to the next level, the Exploitation Phase.

3.3.1 Innovation management radar

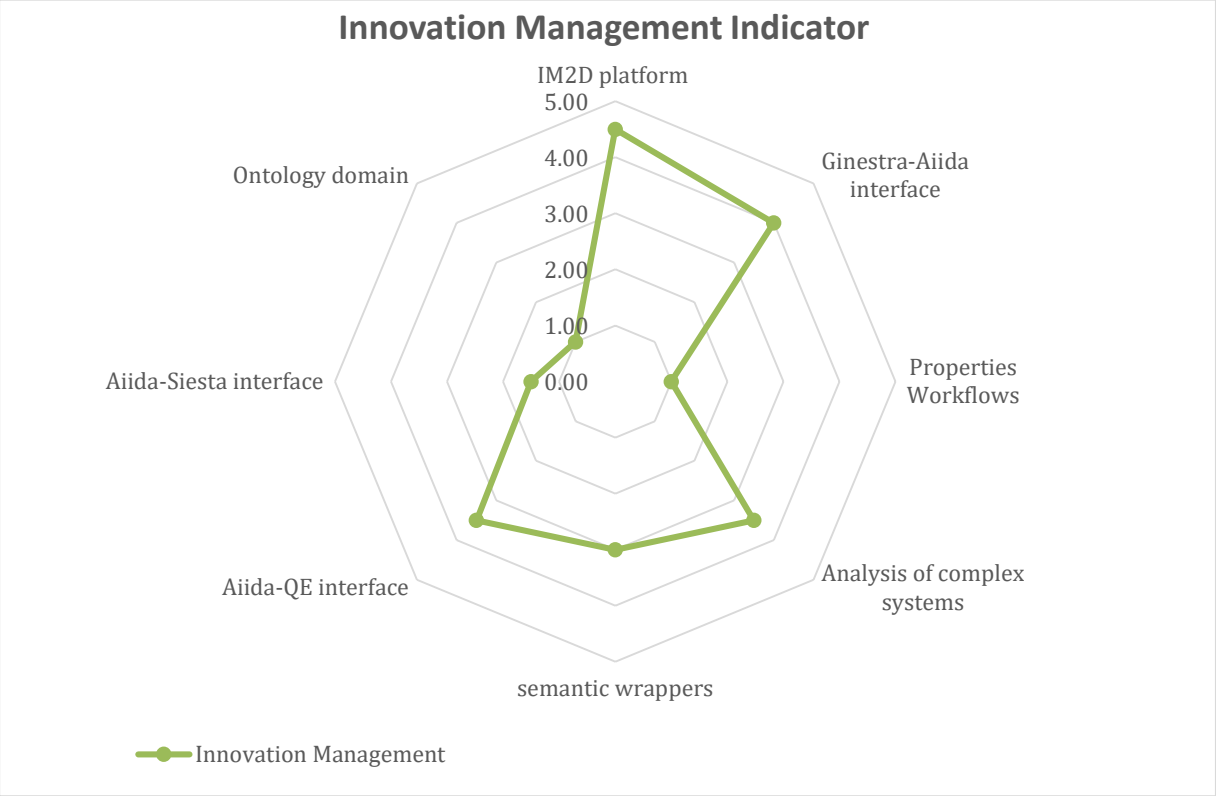

Figure 5. Innovation Management Radar.

3.3.2 Market potential radar

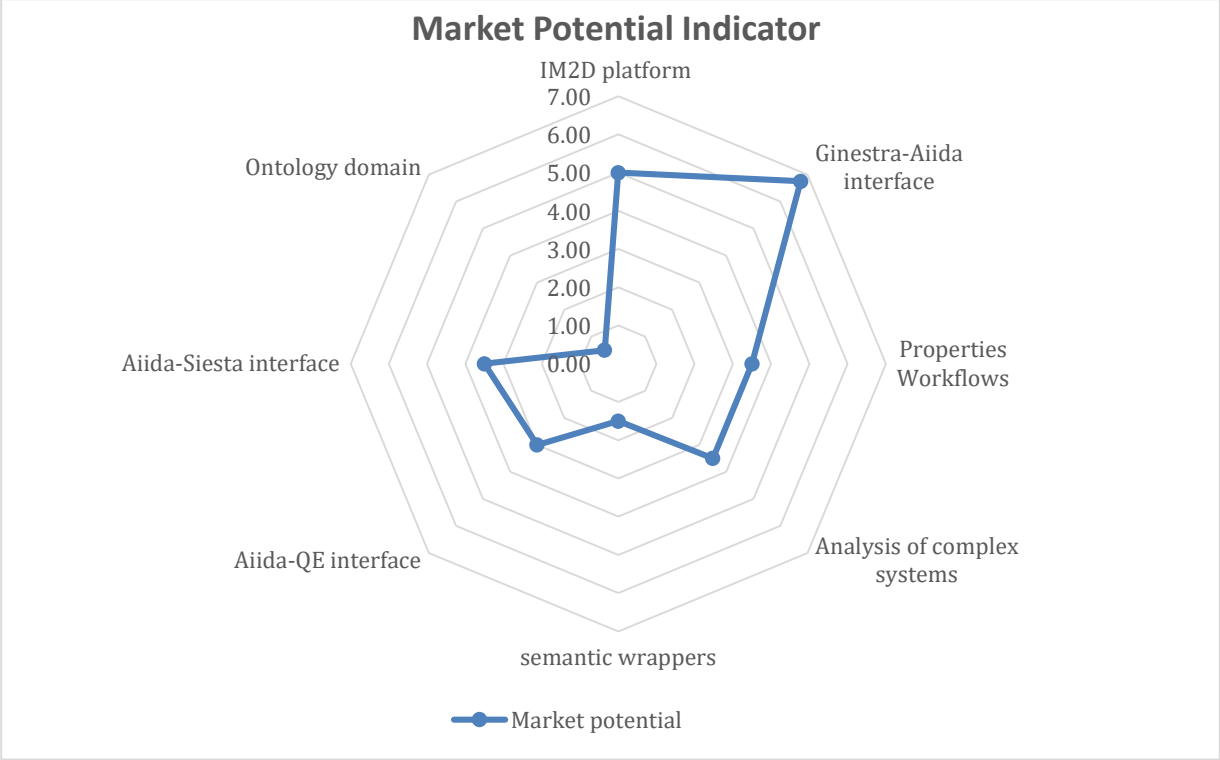

Figure 6. Market Potential Indicator.

3.3.3 Innovation readiness radar

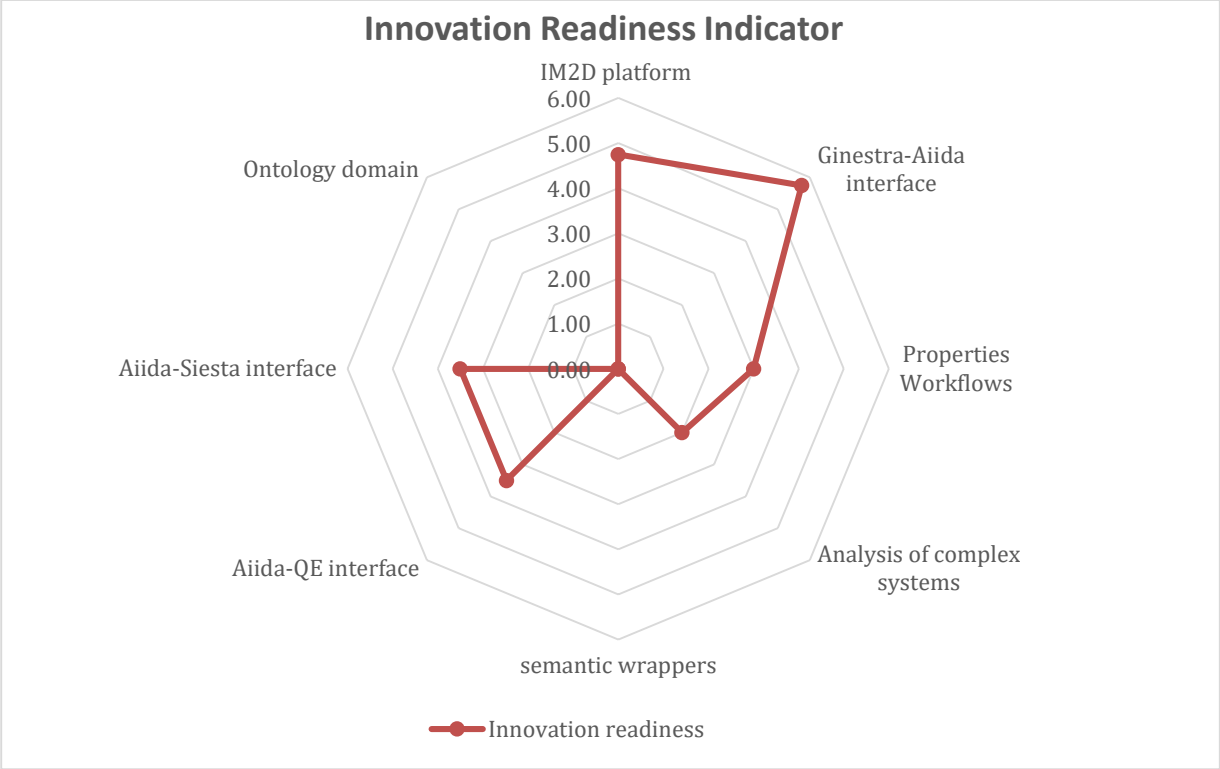

Figure 7. Innovation Readiness Radar.

3.3.4 Innovation maturity level

As mentioned above, instead of using the R-W-W scheme here we adopted the EU standard 4 levels of IMM [1] (described in ANNEX 1). This approach exploits the Innovation management and Innovation readiness indicators to identify the level of maturity of the innovation. Results are summarized in Figure 8. The ontology domain, the property workflows, and the semantic wrappers are in the “exploring zone”. No strategy has been defined so far for exploiting these innovations. AiiDA-SIESTA is entering the “tech ready” area, where the AiiDAa-QE is already positioned. The analysis of complex systems, the IM2D platform, and the Ginestra-AiiDA Interface are the most mature. These results have the chance to be transformed into marketable products.

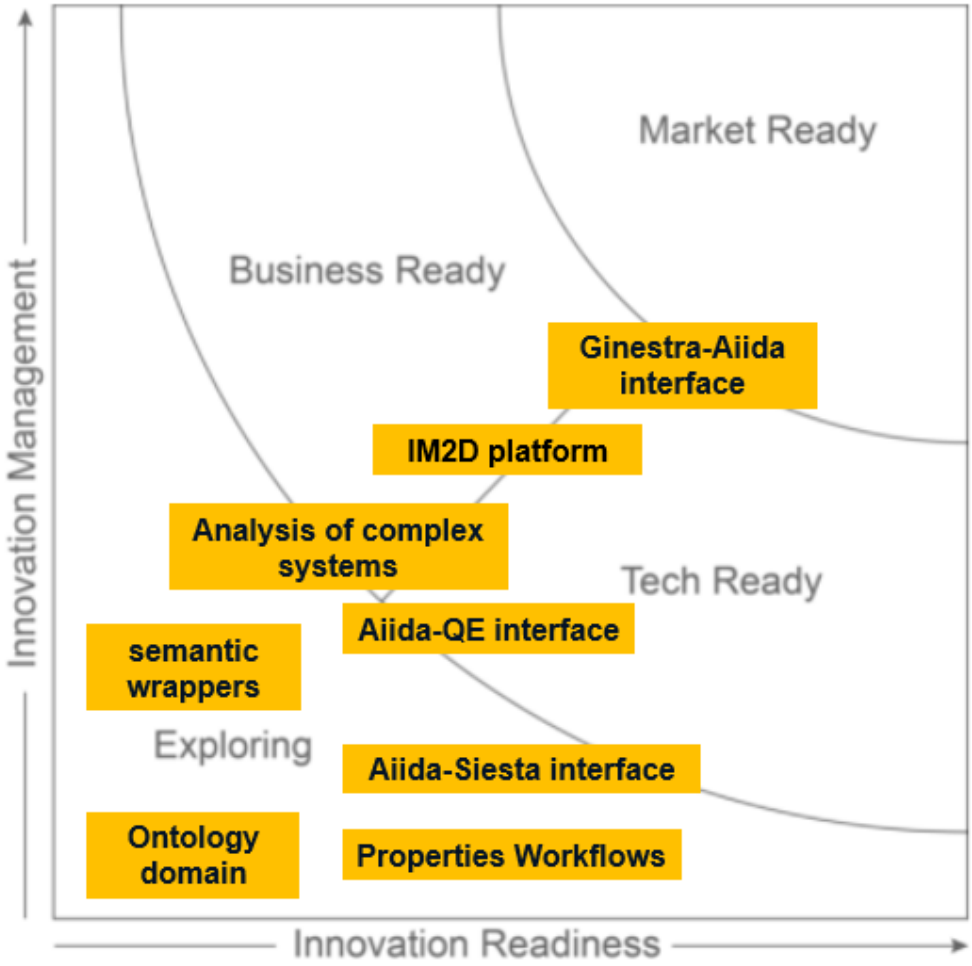

Figure 8. Innovation maturity level.

3.3.5 Innovation potential factor

At the end of the Assessment phase, the innovation candidates with a high rank of Innovation Potential Indicator have been qualified as key exploitable results, and moved to the next level, the Exploitation Phase. Table 11. and Figures 9-10 wrap up the results of the Assessment phase assigning a percentual rate to each innovation related to the maximum score of the single indicators (the scores metrics are reported in Annex 1).

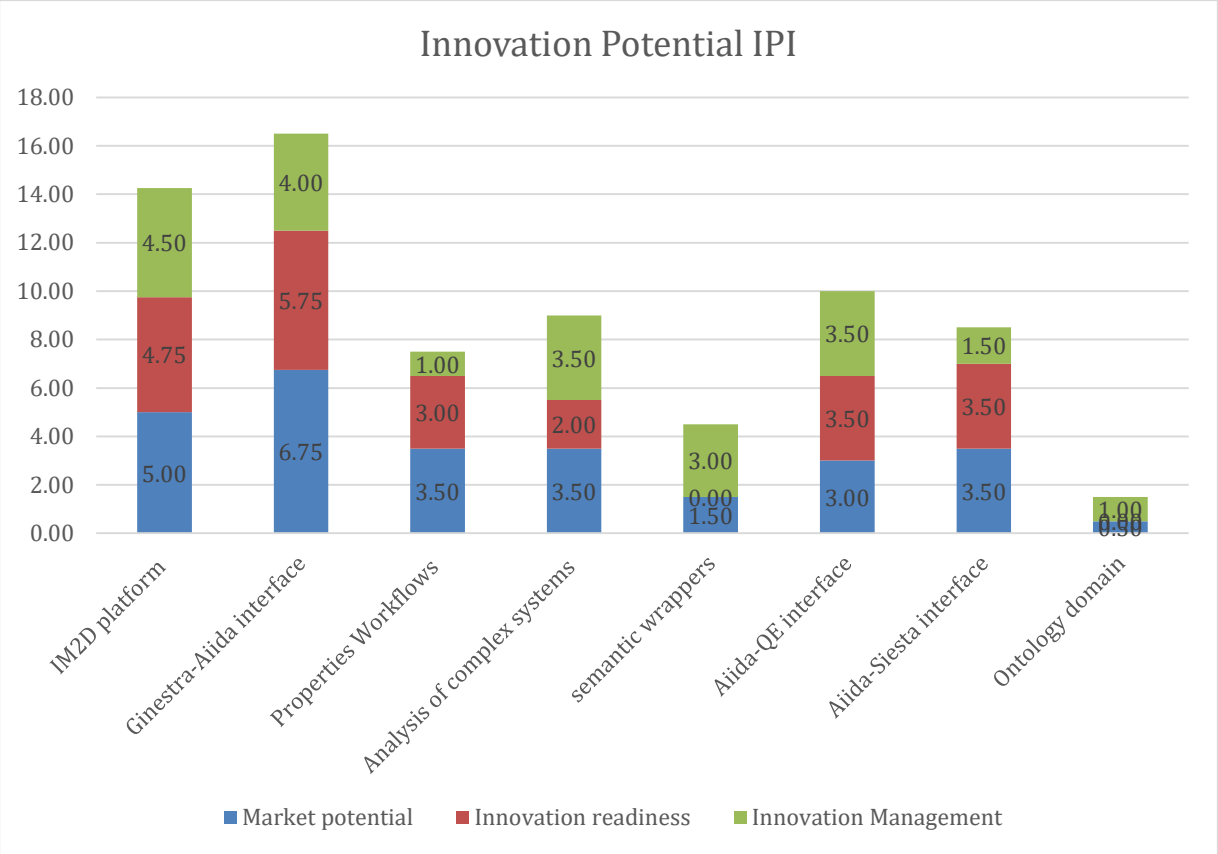

Figure 9. IMI, IRI, IMI scores.

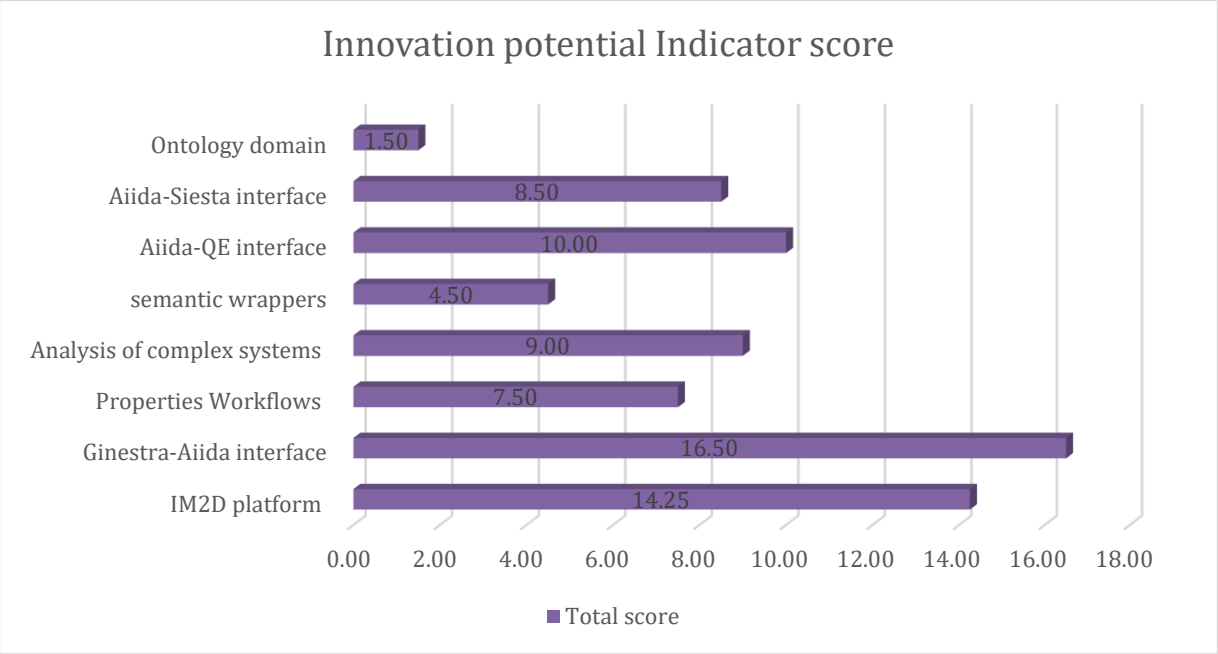

Figure 10. IPI Scores.

Innovation position	Market potential IMI	Innovation readiness IRI	Innovation Management IMI	Innovation performance indicator IPI
IM2D Platform	50%	48%	45%	**48%**
Ginestra-AiiDA interface	68%	58%	40%	**55%**
Properties workflows	35%	30%	10%	**25%**
Analysis of complex systems	35%	20%	35%	**30%**
Semantic wrappers	15%	0%	30%	**15%**
AiiDA-QE interface	30%	35%	35%	**33%**
AiiDA-SIESTA interface	35%	35%	15%	**28%**
Ontology domain	5%	0%	10%	**5%**

Table 11. Indicator scores of innovation candidates.

3.3.6 Key exploitable results list

Considering the IPI results, we classified the list of the key exploitable results (Table 12). Since Ontology domain has an IPI of 5%, this innovation result has not been qualified for the next phase.

#	WP	Innovation
1	All	IM2D platform
2	2	Ginestra-AiiDA interface
3	2	AiiDA-QE interface
4	2	AiiDA-SIESTA interface
5	2	Properties workflows
6	3	Analysis of complex systems
7	2	Semantic wrappers
~~8~~	~~1~~	~~Ontology domain~~

Table 12. Final selection chart of innovation candidates.

DISCLAIMER: *This selection chart is only related to the innovation potential of the results in view of a possible exploitation as individual products. As such, this score **IS NOT an indicator of the quality** of the implementation done or of the relevance of this result within the INTERSECT project.*

3.4 Exploitation activity status

Starting from the list of key exploitable results, the Innovation Manager identified the best business model that can be adopted to maximize the business growth of the results. The plan will be discussed with the AEB, before its actuation. The exploitation activity is directly connected with the D4.7 “Business plan assessment and revision”. In this chapter we describe the suitable business models and we associate them to the exploitable results. D4.7 is dedicated to the creation of the business model canvas and the identification of the target market and audience for the key exploitable results.

3.4.1 Business models description

In this chapter we will distinguish in two main categories:

- Free and Open Source Software (FOSS) models
- Revenue models.

Open Source business models

According to the European Materials Modelling Council (EMMC) White paper "Business models and sustainability for materials modelling software", the following business models based on Free and Open Source software [2] [3] [5] are available:

- **Loss-leader/market positioner:** use open source software to create or maintain a market position for proprietary software (e.g., an open source client creates a market for a proprietary server).
- **"Widget frosting":** publish open source drivers for proprietary hardware, both for peer review benefits and also to allow operating system vendors/maintainers to adapt the driver to future changes in system interfaces.
- **Consulting:** use expertise in an open source product to drive revenue for packaging and/or consulting services (e.g., OpenFOAM).
- **Accessorising:** sell books or other accessories to open source products (e.g., O'Reilly publishers).
- **"Free the future, sell the present":** sell a proprietary product with a license that guarantees open source release after a certain time, in order to guarantee future maintainability to prospective customers (e.g., Alladdin, GhostScript).
- **"Free the software, sell the brand":** charge for the branded, trademarked, tested, and certified version of an open source product (e.g., RedHat, SUSE).

Revenue Models

Software businesses derive revenue in a number of different ways [4]. A typical business model is based on a hybrid approach utilizing a range of revenue models. Revenue Models relevant to materials modelling software include:

Revenue model for the product

- **Perpetual license:** sell a software product at a set price and profit from the sales. Is not a recursive business. Software is always sold for an upfront price. Charge fees are quoted every year for the maintenance of the software.
- **Subscription:** offer a time-based recursive business, which lets the customer use the software product for a certain amount of time and/or a number of users.
- **In-app purchases/Freemium:** part of the software product's functionality is for free and the customer will pay to enable additional features. Another option is to set a 'trial period' and let users enjoy all the features for a limited amount of time.

Revenue model for services

- **Support / consulting:** let the product completely free and get revenue from support/ consulting services. It is time limited, not recursive and focused on specific topics. It is a suitable business model for academic institutions.
- **Customization**: revenue from end customer product customization.

Government funding: governments provide grants for funding the development and sustainment of the software. Once a grant is awarded, the revenue stream is virtually assured for a limited period of time.

3.4.2 Key exploitable results

We have identified the best business model for each key exploitable result (Table 13):

#	Key exploitable result	Business Model	
		Free and Open Source Software (FOSS)	Revenue models
1	IM2D platform	Consulting	Subscription to Ginestra™
2	Ginestra-AiiDA interface	Consulting	Support / consulting Government funding
3	AiiDA-QE interface	Consulting	Government funding
4	AiiDA-SIESTA interface	Consulting	**Support / consulting** Government funding
5	Properties workflows	Consulting	Government funding
6	Analysis of complex systems		**Support / consulting revenue models** Government funding
7	Semantic wrappers	Consulting	Government funding

Table 13. Business model associated to key exploitable results.

4. Conclusions

In this deliverable, the INTERSECT innovation management plan has been assessed and revised from the D4.5 version. Starting from the Innovation roadmap defined in D4.5 and analyzing the project deliverable plan, we performed the Scouting activity through the innovation radar survey and we identified the list of innovation candidates. We further performed a review of the Mapping phase and of the innovation roadmap based on the innovation candidates list using the same criteria. During the Assessment phase, the key exploitable results have been classified by ranking the innovation candidates with the IPI. At the end, we associated the appropriate business models to the innovations during the Exploitation phase. The business model canvas, and the market insight will be investigated in D4.7.

Even though the INTERSECT project is mainly focused on the IM2D platform, as a result of the IM process we identified other six promising candidates that can be exploited independently as key innovation results.

Figure 11. Innovation management actions and results.

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ACRONYMS

AEB - Advisory and Exploitation Board

D2M - Device-to-Material

DoA - Description of the Action

EMMC - European Materials Modelling Council

EMMO - European Materials Modelling Ontology

EU - European Union

FOSS - Free and Open Source Software

GUI - Graphical User Interface

IM - Innovation Management

IM2D - Interoperable Material-to-Device

IMI - Innovation Management Indicator

IMM - Innovation Maturity Model

IP - Intellectual Property

IPI - Innovation Potential Indicator

IPR - Intellectual Property Rights

IR - Innovation Readiness

IRI - Innovation Readiness Indicator

M2D - Material-to-Device

MPI - Market Potential Indicator

MRL - Market Readiness Level

OTS - Ovonic Threshold Switching

QE - Quantum ESPRESSO

R-W-W - Real-Win-Worth

SGM - Stage Gate Model

TRL - Technology Readiness Level

WP - Work Package

ANNEX 1

IM2D RADAR SURVEY

INTERSECT	*Innovation Radar questionnaire*
QUESTIONS	**ANSWERS**
1) Describe the innovation (in less than 300 characters, spaces included):	IM2D is an integrated, standardized, interoperable software platform conceived for the direct and easy exploitation by industrial users to accelerate the development of emerging electronic devices such as FeFET, memristors (PCM, RRAM), and selectors. IM2D is a multi-physics, multi-model, multi-equation, hierarchical and scale-reversible model for material-to-device and device-to-material optimization for an easier exploration of the material workspace from an electronic device-oriented industrial perspective
2) Is the innovation developed within the project...:	
a) Under development	☑
b) Already developed but not yet being exploited	☐
c) being exploited	☐
3) Characterise the type of innovation (only to be answered if 2b or 2c is selected)	
- Significantly improved product	☐
- New product	☐
- Significantly improved service (except consulting ones)	☐
- New service (except consulting ones) - Significantly improved process	☐
- New process	☐
- Significantly improved marketing method	☐
- New marketing method	☐
- Significantly improved organisational method	☐
- New organisational method - Consulting services	☐
- Other	☐
4) If other, please specify:	
5) Characterise the macro type of innovation (only to be answered if "under development" is selected for Q2):	
- Product	☑
- Marketing method	☐
- Organisational method	☐
- Process	☐
- Service (non-consulting)	☐
- Consulting service	☐
- Do not know yet	☐
6) Will the innovation be introduced to the market or deployed within a partner:	
a) Introduced new to the market (commercial exploitation)	☑
b) Deployed within a partner (internal exploitation: Changes in organisation, new internal processes implemented, etc.)	☐
c) No exploitation planned	☐
7) If no exploitation planned, please explain why no exploitation is planned (answer only if 6(c) is selected)	
8) Is there a clear owner of the innovation in the consortium or multiple owners?	
- A clear owner	☐
- Multiple owners	☑
9) Indicate who is the "owner" of the innovation: ...	All the consortium members

10) Indicate the step(s) already done (or are foreseen) in the project in order to bring the innovation to (or closer to) the market (answer only if 6(a) is selected)	Done	Planned	Not Planned	Desirable
technology Transfer		X		
ndustrial research team of one of their company's business units in project activities		X		
Pilot		X		
Capital Investment (VC, Angel, Other)			X	
Investment from public Autority (national, regional)		X		
Business Plan	X			
Prototyping	X			
Market study	X			
Demonstration or Testing activities	X			
Feasibility Study	X			
Launch a Start up or Spin off			X	
Other				

11) If other, please specify	
12) Indicate which participant(s) (up to a maximum of 3) is/are the key organisation(s) in the project delivering this innovation. For each of these identify under the next question their needs to fulfil their market potential. Org1: Org2: Org3:	EPFL, CNR, AMAT

13) Indicate their needs to fulfil their market potential	*Investor readiness Training*	*Investor introductions*	*Biz Plan development*	*Expanding to more market*	*Legal advice*	*Mentoring*	*Partnership with other company*	*Incubation*	*Startup accelerator*
EPFL			X				X		
CNR							X		
AMAT				X					

14) When do you expect that such innovation could be commercialised? (answer only if 6(a) is selected)	
- Less than 1 year	☐
- Between 1 and 2 years	☑
- Between 3 and 5 years	☐
- More than 5 years	☐

15) Have any of the project partners.. (only to be answered if "Done" or "Planned in Project" is chosen for 10.5 "Investment from public authority")	
a) already applied for support from private investors	☐
b) already applied for investement from public authorities	☑
c) Planning to start discussions with private or public investors	☐

16) Which partners are in discussion with investors (or are planning such discussions)?	All consortium members for next Horizon Europe call

ONTOLOGY DOMAIN RADAR SURVEY

INTERSECT	*Innovation Radar questionnaire*
QUESTIONS	**ANSWERS**
1) Describe the innovation (in less than 300 characters, spaces included):	Domain ontology to describe all relevant representational primitives include information about their meaning and constraints on their logically consistent application. Ontology defines a set of representational primitives with which to model a domain of knowledge or discourse. The representational primitives are typically classes (or sets), attributes (or properties), and relationships (or relations among class members).
2) Is the innovation developed within the project...:	
a) Under development	☑
b) Already developed but not yet being exploited	☐
c) being exploited	☐
3) Characterise the type of innovation (only to be answered if 2b or 2c is selected)	
- Significantly improved product	☐
- New product	☐
- Significantly improved service (except consulting ones)	☐
- New service (except consulting ones) - Significantly improved process	☐
- New process	☐
- Significantly improved marketing method	☐
- New marketing method	☐
- Significantly improved organisational method	☐
- New organisational method - Consulting services	☐
- Other	☐
4) If other, please specify:	
5) Characterise the macro type of innovation (only to be answered if "under development" is selected for Q2):	
- Product	☐
- Marketing method	☐
- Organisational method	☐
- Process	☐
- Service (non-consulting)	☐
- Consulting service	☑
- Do not know yet	☐
6) Will the innovation be introduced to the market or deployed within a partner:	
a) Introduced new to the market (commercial exploitation)	☐
b) Deployed within a partner (internal exploitation: Changes in organisation, new internal processes implemented, etc.)	☐
c) No exploitation planned	☑
7) If no exploitation planned, please explain why no exploitation is planned (answer only if 6(c) is selected)	the ontologies will be open source
8) Is there a clear owner of the innovation in the consortium or multiple owners?	
- A clear owner	☐
- Multiple owners	☑
9) Indicate who is the "owner" of the innovation: ...	IWM + use case partners as domain experts

10) Indicate the step(s) already done (or are foreseen) in the project in order to bring the innovation to (or closer to) the market (answer only if 6(a) is selected)	Done	Planned	Not Planned	Desirable
technology Transfer				
ndustrial research team of one of their company's business units in project activities				
Pilot				
Capital Investment (VC, Angel, Other)				
Investment from public Autority (national, regional)				
Business Plan				
Prototyping				
Market study				
Demonstration or Testing activities				
Feasibility Study				
Launch a Start up or Spin off				
Other				

11) If other, please specify	

12) Indicate which participant(s) (up to a maximum of 3) is/are the key organisation(s) in the project delivering this innovation. For each of these identify under the next question their needs to fulfil their market potential. Org1: Org2: Org3:	FRAUNHOFER IWM

13) Indicate their needs to fulfil their market potential	Investor readiness Training	Investor introductions	Biz Plan development	Expanding to more market	Legal advice	Mentoring	Partnership with other company	Incubation	Startup accelerator
FRAUNHOFER IWM			X	X					

14) When do you expect that such innovation could be commercialised? (answer only if 6(a) is selected)	
- Less than 1 year	☐
- Between 1 and 2 years	☐
- Between 3 and 5 years	☐
- More than 5 years	☐

15) Have any of the project partners... (only to be answered if "Done" or "Planned in Project" is chosen for 10.5 "Investment from public authority")	
a) already applied for support from private investors	☐
b) already applied for investement from public authorities	☐
c) Planning to start discussions with private or public investors	☐

16) Which partners are in discussion with investors (or are planning such discussions)?	

GINESTRA-AIIDA INTERFACE RADAR SURVEY

INTERSECT	*Innovation Radar questionnaire*
QUESTIONS	**ANSWERS**
1) Describe the innovation (in less than 300 characters, spaces included):	INTERSECT Ginestra-AiiDA plugin allows to exchange EMMO compliant data from/to AiiDA database in both the M2D and D2M workflows. For M2D workflow, It is possible to retrieve/import a crystalline structure, retrieve a physical property, or submit/monitor the property computation. in case of D2M the interface queries the AiiDA database via the REST-API looking for the materials that match the outputs of the first block. Query may be refined according to specific filters: candidate materials list, variability range for the parameter, concatenation of multiple conditions (e.g. the material should satisfy both the band-gap and the dielectric constant values).
2) Is the innovation developed within the project...:	
a) Under development	☐
b) Already developed but not yet being exploited	☑
c) being exploited	☐
3) Characterise the type of innovation (only to be answered if 2b or 2c is selected)	
- Significantly improved product	☑
- New product	☐
- Significantly improved service (except consulting ones)	☐
- New service (except consulting ones) - Significantly improved process	☐
- New process	☐
- Significantly improved marketing method	☐
- New marketing method	☐
- Significantly improved organisational method	☐
- New organisational method - Consulting services	☐
- Other	☐
4) If other, please specify:	
5) Characterise the macro type of innovation (only to be answered if "under development" is selected for Q2):	
- Product	☑
- Marketing method	☐
- Organisational method	☐
- Process	☐
- Service (non-consulting)	☐
- Consulting service	☐
- Do not know yet	☐
6) Will the innovation be introduced to the market or deployed within a partner:	
a) Introduced new to the market (commercial exploitation)	☑
b) Deployed within a partner (internal exploitation: Changes in organisation, new internal processes implemented, etc.)	☐
c) No exploitation planned	☐
7) If no exploitation planned, please explain why no exploitation is planned (answer only if 6(c) is selected)	
8) Is there a clear owner of the innovation in the consortium or multiple owners?	
- A clear owner	☑
- Multiple owners	☐
9) Indicate who is the "owner" of the innovation: ...	AMAT EPFL

10) Indicate the step(s) already done (or are foreseen) in the project in order to bring the innovation to (or closer to) the market (answer only if 6(a) is selected)	Done	Planned	Not Planned	Desirable
technology Transfer			X	
ndustrial research team of one of their company's business units in project activities	X			
Pilot	X			
Capital Investment (VC, Angel, Other)			X	
Investment from public Autority (national, regional)			X	
Business Plan		X		
Prototyping	X			
Market study		X		
Demonstration or Testing activities	X			
Feasibility Study	X			
Launch a Start up or Spin off			X	
Other				

11) If other, please specify	

12) Indicate which participant(s) (up to a maximum of 3) is/are the key organisation(s) in the project delivering this innovation. For each of these identify under the next question their needs to fulfil their market potential. Org1: Org2: Org3:	AMAT

13) Indicate their needs to fulfil their market potential	*Investor readiness Training*	*Investor introductions*	*Biz Plan development*	*Expanding to more market*	*Legal advice*	*Mentorign*	*Partnership with other company*	*Incubation*	*Startup accelerator*
AMAT				X			X		
EPFL			X						

14) When do you expect that such innovation could be commercialised? (answer only if 6(a) is selected)	
- Less than 1 year	☐
- Between 1 and 2 years	☑
- Between 3 and 5 years	☐
- More than 5 years	☐

15) Have any of the project partners... (only to be answered if "Done" or "Planned in Project" is chosen for 10.5 "Investment from public authority")	
a) already applied for support from private investors	☐
b) already applied for investement from public authorities	☐
c) Planning to start discussions with private or public investors	☐

16) Which partners are in discussion with investors (or are planning such discussions)?	

PROPERTY WORKFLOW RADAR SURVEY

Innovation Radar questionnaire

QUESTIONS	ANSWERS
1) Describe the innovation (in less than 300 characters, spaces included):	specific workflows for advanced on-demand properties (e.g., structural import data and relaxation, band structure calculation, determination of defect formation energy, computation of dielectric constants, and
2) Is the innovation developed within the project...:	
a) Under development	☐
b) Already developed but not yet being exploited	☑
c) being exploited	☐
3) Characterise the type of innovation (only to be answered if 2b or 2c is selected)	
- Significantly improved product	☑
- New product	☐
- Significantly improved service (except consulting ones)	☐
- New service (except consulting ones) - Significantly improved process	☐
- New process	☐
- Significantly improved marketing method	☐
- New marketing method	☐
- Significantly improved organisational method	☐
- New organisational method - Consulting services	☐
- Other	☐
4) If other, please specify:	
5) Characterise the macro type of innovation (only to be answered if "under development" is selected for Q2):	
- Product	☐
- Marketing method	☐
- Organisational method	☐
- Process	☐
- Service (non-consulting)	☑
- Consulting service	☐
- Do not know yet	☐
6) Will the innovation be introduced to the market or deployed within a partner:	
a) Introduced new to the market (commercial exploitation)	☐
b) Deployed within a partner (internal exploitation: Changes in organisation, new internal processes implemented, etc.)	☑
c) No exploitation planned	☐
7) If no exploitation planned, please explain why no exploitation is planned (answer only if 6(c) is selected)	
8) Is there a clear owner of the innovation in the consortium or multiple owners?	
- A clear owner	☐
- Multiple owners	☑
9) Indicate who is the "owner" of the innovation: ...	EPFL, CNR, ICN2+CSIC

10) Indicate the step(s) already done (or are foreseen) in the project in order to bring the innovation to (or closer to) the market (answer only if 6(a) is selected)	Done	Planned	Not Planned	Desirable
technology Transfer			X	
ndustrial research team of one of their company's business units in project activities		X		
Pilot			X	
Capital Investment (VC, Angel, Other)			X	
Investment from public Autority (national, regional)		X		
Business Plan			X	
Prototyping	X			
Market study			X	
Demonstration or Testing activities	X			
Feasibility Study	X			
Launch a Start up or Spin off				
Other				

11) If other, please specify	

12) Indicate which participant(s) (up to a maximum of 3) is/are the key organisation(s) in the project delivering this innovation. For each of these identify under the next question their needs to fulfil their market potential. Org1: Org2: Org3:	EPFL, CNR, ICN2+CSIC

13) Indicate their needs to fulfil their market potential	*Investor readiness Training*	*Investor introductions*	*Biz Plan development*	*Expanding to more market*	*Legal advice*	*Mentoring*	*Partnership with other company*	*Incubation*	*Startup accelerator*
EPFL			X				X		
CNR			X				X		
ICN2+CSIC			X				X		

14) When do you expect that such innovation could be commercialised? (answer only if 6(a) is selected)	
- Less than 1 year	☐
- Between 1 and 2 years	☐
- Between 3 and 5 years	☑
- More than 5 years	☐

15) Have any of the project partners... (only to be answered if "Done" or "Planned in Project" is chosen for 10.5 "Investment from public authority")	
a) already applied for support from private investors	☐
b) already applied for investement from public authorities	☐
c) Planning to start discussions with private or public investors	☑

16) Which partners are in discussion with investors (or are planning such discussions)?	EPFL, CNR, ICN2+CSIC for Horizon Europe

ANALYSIS OF COMPLEX SYSTEM RADAR SURVEY

Innovation Radar questionnaire

QUESTIONS	ANSWERS
1) Describe the innovation (in less than 300 characters, spaces included):	Ab initio and physical modeling on-demand for material discovering and material characterization.
2) Is the innovation developed within the project...:	
a) Under development	☑
b) Already developed but not yet being exploited	☐
c) being exploited	☐
3) Characterise the type of innovation (only to be answered if 2b or 2c is selected)	
- Significantly improved product	☐
- New product	☐
- Significantly improved service (except consulting ones)	☐
- New service (except consulting ones) - Significantly improved process	☐
- New process	☐
- Significantly improved marketing method	☐
- New marketing method	☐
- Significantly improved organisational method	☐
- New organisational method - Consulting services	☐
- Other	☐
4) If other, please specify:	
5) Characterise the macro type of innovation (only to be answered if "under development" is selected for Q2):	
- Product	☐
- Marketing method	☐
- Organisational method	☐
- Process	☐
- Service (non-consulting)	☐
- Consulting service	☑
- Do not know yet	☐
6) Will the innovation be introduced to the market or deployed within a partner:	
a) Introduced new to the market (commercial exploitation)	☑
b) Deployed within a partner (internal exploitation: Changes in organisation, new internal processes implemented, etc.)	☐
c) No exploitation planned	☐
7) If no exploitation planned, please explain why no exploitation is planned (answer only if 6(c) is selected)	
8) Is there a clear owner of the innovation in the consortium or multiple owners?	
- A clear owner	☑
- Multiple owners	☐
9) Indicate who is the "owner" of the innovation: ...	CNR

10) Indicate the step(s) already done (or are foreseen) in the project in order to bring the innovation to (or closer to) the market (answer only if 6(a) is selected)	Done	Planned	Not Planned	Desirable
technology Transfer			X	
ndustrial research team of one of their company's business units in project activities				X
Pilot				X
Capital Investment (VC, Angel, Other)			X	
Investment from public Autority (national, regional)			X	
Business Plan			X	
Prototyping		X		
Market study		X		
Demonstration or Testing activities		X		
Feasibility Study		X		
Launch a Start up or Spin off			X	
Other				

11) If other, please specify	

12) Indicate which participant(s) (up to a maximum of 3) is/are the key organisation(s) in the project delivering this innovation. For each of these identify under the next question their needs to fulfil their market potential. Org1: Org2: Org3:	CNR

13) Indicate their needs to fulfil their market potential	*Investor readiness Training*	*Investor introductions*	*Biz Plan development*	*Expanding to more market*	*Legal advice*	*Mentorign*	*Partnership with other company*	*Incubation*	*Startup accelerator*
CNR			X		X	X	X		

14) When do you expect that such innovation could be commercialised? (answer only if 6(a) is selected)	
- Less than 1 year	☐
- Between 1 and 2 years	☐
- Between 3 and 5 years	☑
- More than 5 years	☐

15) Have any of the project partners... (only to be answered if "Done" or "Planned in Project" is chosen for 10.5 "Investment from public authority")	
a) already applied for support from private investors	☐
b) already applied for investement from public authorities	☐
c) Planning to start discussions with private or public investors	☐

16) Which partners are in discussion with investors (or are planning such discussions)?	

SEMANTIC WRAPPERS RADAR SURVEY

INTERSECT	*Innovation Radar questionnaire*
QUESTIONS	**ANSWERS**
1) Describe the innovation (in less than 300 characters, spaces included):	Semantic interfaces (wrappers) between simulation tools and OSP-core. Wrappers are the backbone of the interoperability enabling data sharing and transfer between applications. wRAPPERS can be understood as "bridges" in software development that enable not only the intercommunication between different tools, but also the exchange of meaningful information that can be understood by any tool that "speaks" the same language. Using the wrappers, Symphony analyses the specific use case from user specification and identifies what kind of data and information needs to be exchanged and selects the most appropriate workflow that will be operated by the simulation
2) Is the innovation developed within the project...:	
a) Under development	☑
b) Already developed but not yet being exploited	☐
c) being exploited	☐
3) Characterise the type of innovation (only to be answered if 2b or 2c is selected)	
- Significantly improved product	☐
- New product	☐
- Significantly improved service (except consulting ones)	☐
- New service (except consulting ones) - Significantly improved process	☐
- New process	☐
- Significantly improved marketing method	☐
- New marketing method	☐
- Significantly improved organisational method	☐
- New organisational method - Consulting services	☐
- Other	☐
4) If other, please specify:	
5) Characterise the macro type of innovation (only to be answered if "under development" is selected for Q2):	
- Product	☐
- Marketing method	☐
- Organisational method	☐
- Process	☐
- Service (non-consulting)	☐
- Consulting service	☑
- Do not know yet	☐
6) Will the innovation be introduced to the market or deployed within a partner:	
a) Introduced new to the market (commercial exploitation)	☐
b) Deployed within a partner (internal exploitation: Changes in organisation, new internal processes implemented, etc.)	☐
c) No exploitation planned	☑
7) If no exploitation planned, please explain why no exploitation is planned (answer only if 6(c) is selected)	the wrappers will be open source
8) Is there a clear owner of the innovation in the consortium or multiple owners?	
- A clear owner	☑
- Multiple owners	☐
9) Indicate who is the "owner" of the innovation: ...	Fraunhofer IWM

10) Indicate the step(s) already done (or are foreseen) in the project in order to bring the innovation to (or closer to) the market (answer only if 6(a) is selected)	Done	Planned	Not Planned	Desirable
technology Transfer				
ndustrial research team of one of their company's business units in project activities				
Pilot				
Capital Investment (VC, Angel, Other)				
Investment from public Autority (national, regional)				
Business Plan				
Prototyping				
Market study				
Demonstration or Testing activities				
Feasibility Study				
Launch a Start up or Spin off				
Other				

11) If other, please specify	

12) Indicate which participant(s) (up to a maximum of 3) is/are the key organisation(s) in the project delivering this innovation. For each of these identify under the next question their needs to fulfil their market potential. Org1: Org2: Org3:	Fraunhofer IWM

13) Indicate their needs to fulfil their market potential	*Investor readiness Training*	*Investor introductions*	*Biz Plan development*	*Expanding to more market*	*Legal advice*	*Mentorign*	*Partnership with other company*	*Incubation*	*Startup accelerator*
Fraunhofer IWM			X	X					
Org2									
Org3									

not really applicable since it is open source

14) When do you expect that such innovation could be commercialised? (answer only if 6(a) is selected)	
- Less than 1 year	☐
- Between 1 and 2 years	☐
- Between 3 and 5 years	☐
- More than 5 years	☐

15) Have any of the project partners... (only to be answered if "Done" or "Planned in Project" is chosen for 10.5 "Investment from public authority")	
a) already applied for support from private investors	☐
b) already applied for investement from public authorities	☐
c) Planning to start discussions with private or public investors	☐

16) Which partners are in discussion with investors (or are planning such discussions)?	none

AIIDA- QE INTERFACE RADAR SURVEY

INTERSECT	*Innovation Radar questionnaire*
QUESTIONS	**ANSWERS**
1) Describe the innovation (in less than 300 characters, spaces included):	The Aiida QE interface offers the possibility to access and automatically control the execution of complex quantum mechanical calculations performed with the QE suite. Quantum Espresso is a suite of open-source codes for electronic-structure calculations from first principles, based on density-functional theory, plane waves, and pseudopotentials.
2) Is the innovation developed within the project...:	
a) Under development	☐
b) Already developed but not yet being exploited	☑
c) being exploited	☐
3) Characterise the type of innovation (only to be answered if 2b or 2c is selected)	
- Significantly improved product	☑
- New product	☐
- Significantly improved service (except consulting ones)	☐
- New service (except consulting ones) - Significantly improved process	☐
- New process	☐
- Significantly improved marketing method	☐
- New marketing method	☐
- Significantly improved organisational method	☐
- New organisational method - Consulting services	☐
- Other	☐
4) If other, please specify:	
5) Characterise the macro type of innovation (only to be answered if "under development" is selected for Q2):	
- Product	☑
- Marketing method	☐
- Organisational method	☐
- Process	☐
- Service (non-consulting)	☐
- Consulting service	☐
- Do not know yet	☐
6) Will the innovation be introduced to the market or deployed within a partner:	
a) Introduced new to the market (commercial exploitation)	☑
b) Deployed within a partner (internal exploitation: Changes in organisation, new internal processes implemented, etc.)	☐
c) No exploitation planned	☐
7) If no exploitation planned, please explain why no exploitation is planned (answer only if 6(c) is selected)	
8) Is there a clear owner of the innovation in the consortium or multiple owners?	
- A clear owner	☑
- Multiple owners	☐
9) Indicate who is the "owner" of the innovation: ...	EPFL

10) Indicate the step(s) already done (or are foreseen) in the project in order to bring the innovation to (or closer to) the market (answer only if 6(a) is selected)	Done	Planned	Not Planned	Desirable
technology Transfer			X	
ndustrial research team of one of their company's business units in project activities		X		
Pilot		X		
Capital Investment (VC, Angel, Other)			X	
Investment from public Autority (national, regional)		X		
Business Plan			X	
Prototyping	X			
Market study			X	
Demonstration or Testing activities	X			
Feasibility Study	X			
Launch a Start up or Spin off				
Other				

11) If other, please specify	

12) Indicate which participant(s) (up to a maximum of 3) is/are the key organisation(s) in the project delivering this innovation. For each of these identify under the next question their needs to fulfil their market potential. Org1: Org2: Org3:	AMAT

13) Indicate their needs to fulfil their market potential	*Investor readiness Training*	*Investor introductions*	*Biz Plan development*	*Expanding to more market*	*Legal advice*	*Mentoring*	*Partnership with other company*	*Incubation*	*Startup accelerator*
EPFL			X						

14) When do you expect that such innovation could be commercialised? (answer only if 6(a) is selected)	
- Less than 1 year	☐
- Between 1 and 2 years	☐
- Between 3 and 5 years	☑
- More than 5 years	☐

15) Have any of the project partners... (only to be answered if "Done" or "Planned in Project" is chosen for 10.5 "Investment from public authority")	
a) already applied for support from private investors	☐
b) already applied for investement from public authorities	☐
c) Planning to start discussions with private or public investors	☐

16) Which partners are in discussion with investors (or are planning such discussions)?	

AIIDA-SIESTA INTERFACE RADAR SURVEY

Innovation Radar questionnaire

QUESTIONS	ANSWERS
1) Describe the innovation (in less than 300 characters, spaces included):	The SIESTA program is able to perform, in a single run, the computation of the electronic structure, the optional relaxation of the input structure, and a final analysis step in which a variety of magnitudes can be computed: band structures, projected densities of states, etc. The operations to be carried out are specified in a very flexible input format. AiiDA-SIESTA plugin has been designed to be able to run the most general SIESTA calculation, with support for most of the available
2) Is the innovation developed within the project...:	
a) Under development	☐
b) Already developed but not yet being exploited	☑
c) being exploited	☐
3) Characterise the type of innovation (only to be answered if 2b or 2c is selected)	
- Significantly improved product	☑
- New product	☐
- Significantly improved service (except consulting ones)	☐
- New service (except consulting ones) - Significantly improved process	☐
- New process	☐
- Significantly improved marketing method	☐
- New marketing method	☐
- Significantly improved organisational method	☐
- New organisational method - Consulting services	☐
- Other	☐
4) If other, please specify:	
5) Characterise the macro type of innovation (only to be answered if "under development" is selected for Q2):	
- Product	☑
- Marketing method	☐
- Organisational method	☐
- Process	☐
- Service (non-consulting)	☐
- Consulting service	☐
- Do not know yet	☐
6) Will the innovation be introduced to the market or deployed within a partner:	
a) Introduced new to the market (commercial exploitation)	☐
b) Deployed within a partner (internal exploitation: Changes in organisation, new internal processes implemented, etc.)	☑
c) No exploitation planned	☐
7) If no exploitation planned, please explain why no exploitation is planned (answer only if 6(c) is selected)	
8) Is there a clear owner of the innovation in the consortium or multiple owners?	
- A clear owner	☑
- Multiple owners	☐
9) Indicate who is the "owner" of the innovation: ...	EPFL, ICN2+CSIC

10) Indicate the step(s) already done (or are foreseen) in the project in order to bring the innovation to (or closer to) the market (answer only if 6(a) is selected)	Done	Planned	Not Planned	Desirable
technology Transfer			X	
ndustrial research team of one of their company's business units in project activities		X		
Pilot		X		
Capital Investment (VC, Angel, Other)			X	
Investment from public Autority (national, regional)		X		
Business Plan			X	
Prototyping	X			
Market study			X	
Demonstration or Testing activities	X			
Feasibility Study	X			
Launch a Start up or Spin off				
Other				

11) If other, please specify	

12) Indicate which participant(s) (up to a maximum of 3) is/are the key organisation(s) in the project delivering this innovation. For each of these identify under the next question their needs to fulfil their market potential. Org1: Org2: Org3:	EPFL, ICN2+CSIC

13) Indicate their needs to fulfil their market potential	*Investor readiness Training*	*Investor introductions*	*Biz Plan development*	*Expanding to more market*	*Legal advice*	*Mentoring*	*Partnership with other company*	*Incubation*	*Startup accelerator*
EPFL			X						
ICN2+CSIC		X	X				X		

14) When do you expect that such innovation could be commercialised? (answer only if 6(a) is selected)	
- Less than 1 year	☐
- Between 1 and 2 years	☐
- Between 3 and 5 years	☑
- More than 5 years	☐

15) Have any of the project partners... (only to be answered if "Done" or "Planned in Project" is chosen for 10.5 "Investment from public authority")	
a) already applied for support from private investors	☐
b) already applied for investement from public authorities	☐
c) Planning to start discussions with private or public investors	☐

16) Which partners are in discussion with investors (or are planning such discussions)?	

Market potential scorecard

Market potential	Scoring	IM2D platform	Ginestra-AiiDA interface	Properties Workflows	Analysis of complex systems	Semantic wrappers	AiiDA-QE interface	AiiDA-SIESTA interface	Ontology Domain
Type of innovation:									
New product, process or service	1								
Significantly improved product, process or service	0.75								
New marketing or organizational method	0.5		0.75	0.75			0.75	0.75	
Significantly improved marketing or organizational method, other	0.25								
Consulting services	0								
Type of innovation									
Product or service	0.5								
Process, marketing or organizational method	0	0.5			0.5	0.0			0.0
Consulting services	0								
Innovation exploitation:									
Commercial exploitation	1								
Internal exploitation	0.25	1.0	1.0	0.25	1.0	0.0	0.25	0.25	0.00
No exploitation	0								
External bottlenecks									
No external IPR issues that could compromise the ability of a project partner to exploit the innovation	0.5								
No standards issues that could compromise the ability of a project partner to exploit the innovation	0.5	1.0	2.0	1.0	1.0	0.5	1.0	1.0	0.0
No regulation issues that could compromise the ability of a project partner to exploit the innovation	0.5								

No financing issues that could compromise the ability of a project partner to exploit the innovation	0.5								
No trade issues that could compromise the ability of a project partner to exploit the innovation	0.5								
No other issues that could compromise the ability of a project partner to exploit the innovation	0.5								
Needs of key organizations		2.5	3.0	1.5	1.0	1.0	1.0	1.5	0.5
No investor readiness training need	0.5								
No investor introductions need	0.5								
No biz plan development need	0.5								
No expanding to more markets need	0.5								
No legal advice (IPR or other) need	0.5								
No mentoring need	0.5								
No partnership with other company (technology or other) need	0.5								
No incubation need	0.5								
No startup accelerator need	0.5								
Number of patents have been applied for by the project		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<2	0.25								
≥2	0.5								
Total score		5.00	6.75	3.50	3.50	1.50	3.00	3.50	0.50

Table 14. Mapping Potential Scorecard.

Innovation readiness scorecard

Innovation readiness	Scoring	IM2D platform	Ginestra-AiiDA interface	Properties Workflows	Analysis of complex systems	Semantic wrappers	AiiDA-QE interface	AiiDA-SIESTA interface	Ontology domain
Development phase		0.0	1.0		0.0				
Under development	0								
Developed but not exploited	1								
Being exploited	2								
Technology transfer		0.5	0.0						
Done	1								
Planned	0.5								
Pilot		0.5	1.0	0.0			0.5	0.5	
Done	1								
Planned	0.5								
Prototyping		1.0	1.0	1.0	0.5		1.0	1.0	
Done	1								
Planned	0.5								
Demonstration or testing activities		1.0	1.0	1.0	0.5		1.0	1.0	
Done	1								
Planned	0.5								
Feasibility study		1.0	1.0	1.0	0.5		1.0	1.0	
Done	1								
Planned	0.5								
Other									
Done	1								
Planned	0.5								
Time to market		0.75	0.75		0.50				
Less than 1 year	1								
Between 1 and 2 years	0.75								
Between 3 and 5 years	0.5								
More than 5 years	0.25								

No workforce's skills issues that could compromise the ability of a project partner to exploit the innovation	1								
Total score		4.75	5.75	3.00	2.00	0.00	3.50	3.50	0.00

Table 15. IR Scorecard.

Innovation Management Scorecard

Innovation Management	Scoring	IM2D platform	Ginestra-AiiDA interface	Properties Workflows	Analysis of complex systems	Semantic wrappers	AiiDA-QE interface	AiiDA-SIESTA interface	Ontology Domain
There is a clear owner of the innovation	1	0.0			1.0	1.0	1.0	0.0	0.0
Business plan		1.0	0.5		0.0				
Done	1								
Planned	0.5								
Market study		1.0	0.5		0.5				
Done	1								
Planned	0.5								
Launch of a start-up or spin-off		0.0	0.0		0.0				
Done	1								
Planned	0.5								
No consortium internal IPR issues that could compromise the ability of a project partner to exploit the innovation	1	0.0	0.0	0.0	1.0	1.0	1.0		0.0
Company's business unit involved in project activities		0.5	1.0		0.0				0.0
Done	1								
Planned	0.5								
Capital investment		0.0	0.0		0.0				
Done	1								
Planned	0.5								
Investment from public authority		0.5	0.0		0.0				

Done	1								
Planned	0.5								
End-user engagement									
End-user in the consortium	1	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
End-user consulted	0.5								
No end-user in the consortium or consulted	0								
Commitment of relevant partners to exploit innovation									
Above average	1	0.5	1.0	0.0	0.5	0.0	0.5	0.5	0.0
Average	0.5								
Below average	0								
Total score		4.5	4	1	3.5	3	3.5	1.5	1

Table 16. IM Scorecard.

Innovation Performance Indicator scores

The IPI scoring is the sum of the market potential indicator, the Innovation readiness, and Innovation management. Find the final score based on the previous surveys below (Table 17).

IPI scoring	IM2D platform	Ginestra -AiiDA interface	Properties Workflows	Analysis of complex systems	Semantic wrappers	AiiDA-QE interface	AiiDA-SIESTA interface	Ontology domain
Market potential MAX 10 pt	5.00	6.75	3.50	3.50	1.50	3.00	3.50	0.50
Innovation Readiness MAX 10pt	4.75	5.75	3.00	2.00	0.00	3.50	3.50	0.00
Innovation Management MAX 10pt	4.50	4.00	1.00	3.50	3.00	3.50	1.50	1.00
Innovation performance indicator MAX 30pt	**14.25**	**16.50**	**7.50**	**9.00**	**4.50**	**10.00**	**8.50**	**1.50**

Table 17. IPI Scoring.

EU 4 maturity levels of innovations

Link : https://ec.europa.eu/jrc/sites/default/files/booklet-a4_innovation_radar.pdf

To capture the different maturity levels of innovations towards commercialisation, four innovation categories have been created based on respective IM and IRI scores:

- **Market Ready:** This category includes innovations outperforming in innovation management and innovation readiness. These innovations are technologically mature, and show high commitment of the project consortium to bring them to the market. They are considered “Ready for the market”.
- **Tech Ready:** This category includes innovations progressing on technology development process (e.g., pilots, prototypes, demonstration). They are considered “Advanced on technology preparation”. In order to capitalise on the potential of these

innovations, the management team needs to focus on transforming a novel technology or research results into a marketable product or service and to prepare its commercialisation.

- **Business ready:** This category includes innovations for which concrete market-oriented ideas have been put together (e.g., market studies, business plans, end-user engagement). They are considered "Advanced on market preparation". Their commercialisation depends on the progress of the technology development.
- **Exploring:** This category includes innovations, which actively explore value creation opportunities. They are considered "Getting things started". These innovations are in the early phases of technological readiness, but already show high commitment levels from the organisations developing them. Their commercialisation requires efforts in transforming technology into marketable products. Alternatively, this category includes concrete market-oriented ideas, which depend on further progress on the technology development.

Figure 12. EU levels of innovation.