Digital innovation HUBs and CollAborative Platform for cyber-physical systems

Ecosystem Building

Technical Note Number: D2.2

Version: 1.0

Date: June 2021

Confidential Document

Contributors:

Bogdan Constantin Pirvu (ULBS)

Claudio Sassanelli (POLIMI)

Fredrik Asplund (KTH)

Mats Magnusson (KTH)

Parisa Elahidoost (fortiss)

Editors:

Fredrik Asplund (KTH)

Tobias Vahlne (KTH)

Mats Magnusson (KTH)

Reviewers:

Claudio Sassanelli (POLIMI)

Paola Baruchelli (FBK)

Consortium:

Aarhus University	AU	Newcastle University	UNEW
Fortiss GmbH	FOR	Virtual Vehicle Research GmbH	VV
Fundazione Bruno Kessler	FBK	KTH Royal Institute of Technology	KTH
University "Lucian Blaga" of Sibiu	ULBS	Engineering Ingegneria Informatica S.p.A.	ENGIT
Research Institutes of Sweden AB	RISE	F6S Network Limited	F6S
Politecnico di Milano	POLIMI	Unparallel Innovation	UNP
Controllab Products	CLP	BEIA Consult	BEIA
Verified Systems International GmbH	VSI	Validas	VAL
Technology Transfer Systems srl	TTS		

Document History

Ver.	Date	Author	Description
0.1	31-05-2021	Fredrik Asplund	First, integrated draft for review.
0.2	09-06-2021	Paola Baruchelli	Review
0.3	09-06-2021	Claudio Sassanelli	Review
1.0	14-06-2021	Fredrik Asplund	Final version

List of figures

List of tables

List of Abbreviations

AI	Artificial Intelligence
AM	Additive Manufacturing
DIH	Digital Innovation Hub
D-BEST	Data-Business-Ecosystem-Skills-Technology
IoT	Internet of Things
MBD	Model Based Design
SME	Small and medium-sized enterprise

Executive Summary

The D2.2. Ecosystem Building HUBCAP deliverable describes the work performed by Task T2.2, which supported the ecosystem building for the involved Digital Innovation Hubs (DIHs) during the first half of the HUBCAP project.

Task T2.2 focused on three goals: to describe the DIH ecosystems; to analyse the DIH ecosystems and firms contacting HUBCAP to identify opportunities and threats related to DIH services; and to capitalize on the identified opportunities. The last goal was a stretch goal, which was not explicitly part of the task but nevertheless a sensible goal to aim for.

The task started with questionnaires and interviews to describe the DIH ecosystems according to involved entities, relationships, important learning opportunities according to involved firms, and important learning, networking, and funding opportunities according to the DIHs. Thereafter, the firms that applied to a HUBCAP open call were profiled to identify the application domains they were doing business in, the application domains they wanted to do business in, the scientific skills that they were strong in, and the scientific skills they wanted to be strong(er) in. Their interests in regard to support for these four categories were also investigated.

Based on cross-referencing the data from these investigations, opportunities were identified and discussed with the HUBCAP DIHs. Possibly fruitful activities were related to these opportunities for three of the HUBCAP DIHs. So far this has led to further communication between the DIHs and new firms in their ecosystem, the identification of new opportunities, and two successful applications to the latest HUBCAP open call.

The firms which applications to one of the HUBCAP open calls have been successful were also analysed separately. Based on this analysis, three DIHs have been prompted to organise a small call for information to match their services for funding support to the accepted firms; three DIHs have been prompted to take the lead in organising networking events; two DIHs have been prompted to collaborate on networking in the area of functional safety; and one DIH has been prompted to strongly advertise one of its services related to networking on industrial automation and manufacturing.

Contents

1 Introduction

This deliverable describes the work performed by Task T2.2, which supported the ecosystem building for the involved Digital Innovation Hubs (DIHs) during the first half of the HUBCAP project. This was a first step towards a sustainable outcome from the project. This section describes the intended outcomes of the task, and details them further to both (a) clarify them and (b) relate them to the task activities.

1.1 Task description

Task T2.2, "Ecosystem Building", is described in the DoA as:

"This task will build and expand the local innovation ecosystems around the HUBCAP hubs. In order to understand the existing HUBCAP ecosystem an inventory of relevant stakeholders will be created, for instance by KTH visiting all the DIHs and conducting in-depth interviews with staff from both the public and private parts of their innovation ecosystems. This inventory primarily includes identifying key companies, key research institutes, key academic partners, learning networks, innovation centres, digital hubs, incubators, investors and funding programmes. Based on the inventory, an analysis of the ecosystem will be developed that points out additional opportunities that can be provided by the HUBCAP DIHs to Small and Medium-Sized Enterprises (SMEs), e.g. in terms of training courses and workshops, market access at brokerage events or exhibitions, or funding provided by public programmes or by private investors. Potential gaps in the local ecosystems will be identified and measures taken to reach out to further stakeholders that could be able to fill these gaps."

From this description a number of goals can be elicited.

1.1.1 Goal 1 – Describe the DIH Ecosystems

The first goal of Task T2.2 was to perform an inventory of the involved DIH ecosystems and firms approaching HUBCAP. This involved two activities.

Firstly, a questionnaire was sent out to all involved DIHs, and iterated together with a DIH representative until complete. This questionnaire asked for information regarding the DIHs' business ecosystem, knowledge ecosystem and *most important* learning opportunities according to the *firms* in the DIH ecosystem (with the associated motivation by the firms for their importance). It also asked each DIH to list the learning opportunities, networking opportunities and funding opportunities according to *themselves*. The detailed results from this questionnaire are found in Section 2.

Secondly, a questionnaire is, as part of the HUBCAP open call processes, sent to all firms that applied to one of the open funding calls by HUBCAP (not only those that were approved for funding). This questionnaire asks for which application domains the firms are doing business in, which applications domains they are interested in doing business in, which scientific disciplines they are strong in, and which scientific disciplines they want support with. For the application domains, they are also asked whether they are interested in funding, technical consultancy, business development, learning opportunities, or networking. For the technology domains, they are also asked whether they were interested in recruitment, accessing knowledge, new, novel technology, joining research

projects, or recruitment. The detailed results from this questionnaire up to and including May 2021 are found in Section 3.

1.1.2 Goal 2 – Analyse the DIH Ecosystems and HUBCAP Firms to Identify Opportunities and Threats related to DIH Services

The second goal of Task T2.2 was to analyse the results from the DIH ecosystem inventory and relate it to the results from the firm questionnaire. In this way opportunities, and associated threats, related to the services or knowledge of the DIHs could be identified. The detailed results from this analysis are found in Section 4.

1.1.3 Goal 3 – Capitalize on Opportunities

Even if it is not an explicit goal of Task T2.2, it would make little sense if HUBCAP did not attempt to grasp the identified opportunities, while at the same time mitigating associated threats. The detailed results from these activities are found in Section 5.

1.2 Limitations

The activities towards Goal 1 involved interviews with three representatives of each DIH – a researcher, a project manager and a business developer. These interviews were intended to be performed at the DIHs at the beginning and end of the project. Unfortunately, it was not possible to travel to the DIHs due to the pandemic. Therefore, the first round of interviews was not performed until this spring (2021). The results are thus not finished yet. However, this has not been deemed critical for the task.

2 DIH Ecosystem Inventory

This section summaries the data gathered from the DIHs on their ecosystems. The data is related to the goals of the task, analysed, and discussed in later sections.

More detailed information is available on request if not in conflict with existing confidentiality agreements.

2.1 Ecosystem Entities

The DIHs provided details on entities in their ecosystems, primarily their surrounding business ecosystems. As shown in Figure 1, these ranged from about 50 to 300 entities. It was difficult for the DIHs to share detailed information due to e.g. confidentiality issues.
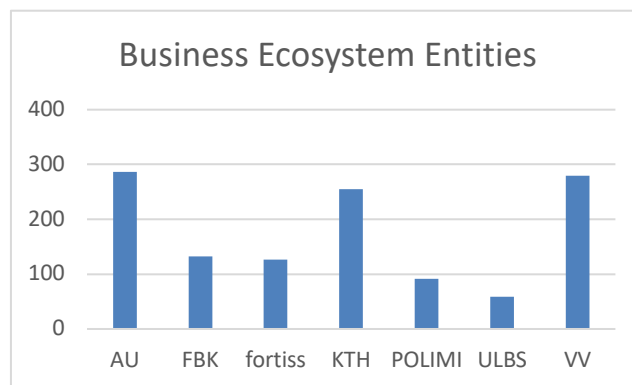
Figure 1 Statistics - Business Ecosystem Entities

2.2 Knowledge Ecosystems

The DIHs provided details on the cooperation on which their knowledge ecosystems were based, i.e. important[1] research projects. As shown in Figure 2, These ranged from about 5 to 40 cooperation projects, which size ranged from 2 to 60 participants.
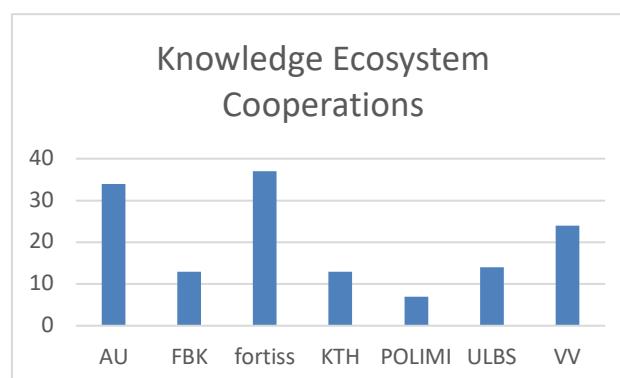
Figure 2 Statistics - Knowledge Ecosystem Cooperations

---

[1] Most important in relation to the HUBCAP project. Naturally, the DIHs are involved in many more research projects, both in relation to and outside of the scope of HUBCAP.

2.3 Important Learning Opportunities – Firms' Perspectives

The DIHs provided information on the most important learning opportunities from the perspective of the firms involved in their ecosystem. Quality before quantity was emphasized. As shown in Figure 3, results pointed at about 2 to 25 opportunities in the form of courses, master programs, certifications, etc. The DIHs also provided qualitative motivations from the firms in their ecosystems regarding why these opportunities were the most important.
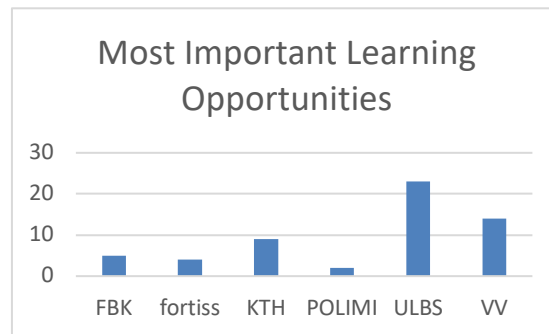
Figure 3 Statistics - Most Important Learning Opportunities

An interesting result was that Denmark has a much more mature lifelong learning framework than other countries, which actively encourages firms to send their employees to university courses. The number of courses in the AU ecosystem that were deemed important enough by firms for them to actively engage thus vastly outnumbered[2] that of the other ecosystems.

2.4 Important Opportunities – DIHs' Perspectives

The DIHs also listed all the learning, networking and funding opportunities that they themselves believed were most important. As shown in Figure 4, the results ranged from a select few to 20 opportunities.
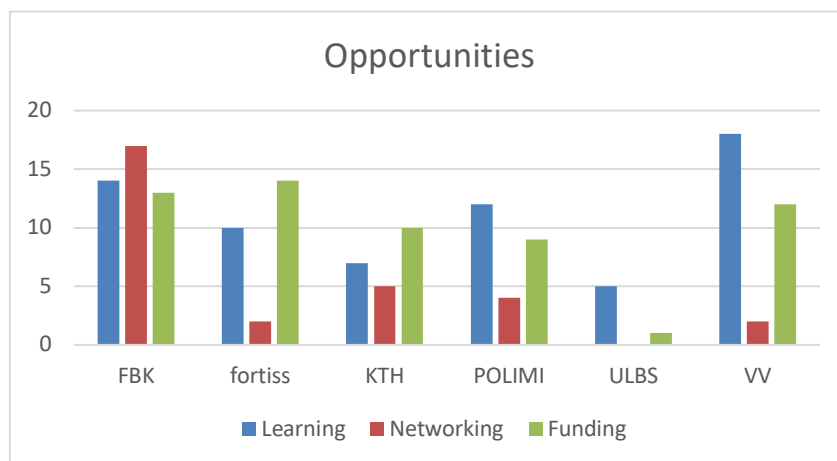
Figure 4 Statistics - Opportunities - DIHs' Perspectives

---

[2] To the point that it makes little sense to skew the statistics here by including them.

3 Firm Inventory

The questionnaire sent to all firms that applied to one of the open funding calls by HUBCAP had, by end of May 2021, been filled out by 113 firms. The most important results are presented below.

These results are related to the goals of the task, analysed, and discussed in later sections.

More detailed information is available on request if not in conflict with existing confidentiality agreements.

3.1 Application Domains and Scientific Disciplines

The firms that have applied to a HUBCAP call are active in and looking to enter hundreds of different application domains. They also have deep knowledge in and looking for support regarding a large set of different scientific disciplines. To exemplify, application domains that were repeatedly mentioned included smart cities, robotics, sensors, automotive, construction, industrial automation, space, smart energy, Internet of Things (IoT), and logistics. Furthermore, to exemplify, scientific disciplines that were repeatedly mentioned included materials science, mechatronics, software engineering, computer science, control theory, mechanical engineering, physics, data science, electronics and mathematics.

3.2 Interest in Support For Application Domains

To understand the need for DIH services, all firms were asked whether they had any interest in support from HUBCAP in the application domains they had indicated. The results are summarized below.

3.2.1 Application Domains Firm Does Business In

As shown in Figure 5, in regard to application domains the firms are doing business in, they were mostly interested in acquiring additional support regarding funding, business development and networking with other firms.

	1 (NO INTEREST)	2	3	4	5	6	7 (HIGH INTEREST)	TOTAL
Identifying and approaching other funding sources	0.00% 0	0.88% 1	1.77% 2	2.65% 3	10.62% 12	9.73% 11	74.34% 84	113
Accessing specialist, technical consultancy	6.19% 7	7.08% 8	9.73% 11	9.73% 11	11.50% 13	19.47% 22	36.28% 41	113
Business development	0.00% 0	0.88% 1	5.31% 6	5.31% 6	14.16% 16	17.70% 20	56.64% 64	113
Learning opportunities (courses, workshops, etc.)	2.68% 3	8.04% 9	8.93% 10	9.82% 11	25.89% 29	19.64% 22	25.00% 28	112
Networking with other companies	0.00% 0	1.77% 2	5.31% 6	5.31% 6	13.27% 15	22.12% 25	52.21% 59	113

Figure 5 Statistics – Needs in Application Domains Firms Do Business In

3.2.2 Application Domains Firm Wants to Do Business In

As shown in Figure 6, in regard to application domains the firms wants to do business in, they were also mostly interested in acquiring additional support regarding funding, business development and networking with other firms

	1 (NO INTEREST)	2	3	4	5	6	7 (HIGH INTEREST)	TOTAL
Identifying and approaching other funding sources	1.96% 2	0.98% 1	3.92% 4	6.86% 7	5.88% 6	15.69% 16	64.71% 66	102
Accessing specialist, technical consultancy	5.88% 6	2.94% 3	7.84% 8	11.76% 12	13.73% 14	20.59% 21	37.25% 38	102
Business development	2.91% 3	1.94% 2	1.94% 2	6.80% 7	10.68% 11	19.42% 20	56.31% 58	103
Learning opportunities (courses, workshops, etc.)	3.88% 4	7.77% 8	9.71% 10	11.65% 12	17.48% 18	20.39% 21	29.13% 30	103
Networking with other companies	0.00% 0	0.97% 1	3.88% 4	6.80% 7	12.62% 13	23.30% 24	52.43% 54	103

Figure 6 Statistics – Needs in Application Domains Firms Wants to Do Business In

3.3 Interest in Support For Scientific Disciplines

To understand the need for DIH services, all firms were asked whether they had any interest in support from HUBCAP in the scientific disciplines they had indicated.

3.3.1 Scientific Disciplines Which the Firm is Strong In

As shown in Figure 7, in regard to scientific disciplines the firms are strong in, they were mostly interested in acquiring additional support regarding novel technology and research projects.

	1 (NO INTEREST)	2	3	4	5	6	7 (HIGH INTEREST)	TOTAL
Recruitment of faculty or students	8.93% 10	5.36% 6	4.46% 5	9.82% 11	19.64% 22	17.86% 20	33.93% 38	112
Accessing knowledge to solve problems you currently face	2.65% 3	6.19% 7	7.96% 9	10.62% 12	9.73% 11	28.32% 32	34.51% 39	113
Access to knowledge on new, novel technology	0.89% 1	0.89% 1	3.57% 4	6.25% 7	13.39% 15	22.32% 25	52.68% 59	112
Identifying and joining research projects	0.88% 1	0.88% 1	2.65% 3	7.96% 9	9.73% 11	15.04% 17	62.83% 71	113

Figure 7 Statistics – Needs Regarding Scientific Disciplines Which the Firms are Strong In

3.3.2 Scientific Disciplines Which the Firm Wants to be Strong(er) In

As shown in Figure 8, the firms were much less interested in acquiring additional support in regard to scientific disciplines they are not yet strong in.

	1 (NO INTEREST)	2	3	4	5	6	7 (HIGH INTEREST)	TOTAL
Recruitment of faculty or students	20.55% 15	4.11% 3	2.74% 2	5.48% 4	19.18% 14	15.07% 11	32.88% 24	73
Accessing knowledge to solve problems you currently face	9.59% 7	4.11% 3	4.11% 3	12.33% 9	8.22% 6	15.07% 11	46.58% 34	73
Access to knowledge on new, novel technology	9.59% 7	1.37% 1	4.11% 3	9.59% 7	10.96% 8	13.70% 10	50.68% 37	73
Identifying and joining research projects	9.46% 7	1.35% 1	4.05% 3	6.76% 5	13.51% 10	10.81% 8	54.05% 40	74

Figure 8 Statistics – Needs Regarding Scientific Disciplines Which the Firms Want to be Strong(er) In

3.4 A Closer Look at Accepted Firms

35 out of the, at least initially, accepted firms had answered the questionnaire. This subsection provides a closer look at their answers, as their interactions with the HUBCAP DIHs should lead to opportunities related to their interest.

3.4.1 Summary of Responses

The summary of the responses for the 35 firms are provided below. The responses which indicated a very large interest by most firms are highlighted in red.

3.4.1.1 Application Domains Firm Does Business In

The most common application domains in which the accepted firms do business are Industrial Automation, Sensors, Automotive, Aerospace, Smart Energy, Smart Cities and Smart Health. As shown in Figure 9, in the application domains the accepted firms do business in they were mostly interested in networking and funding.
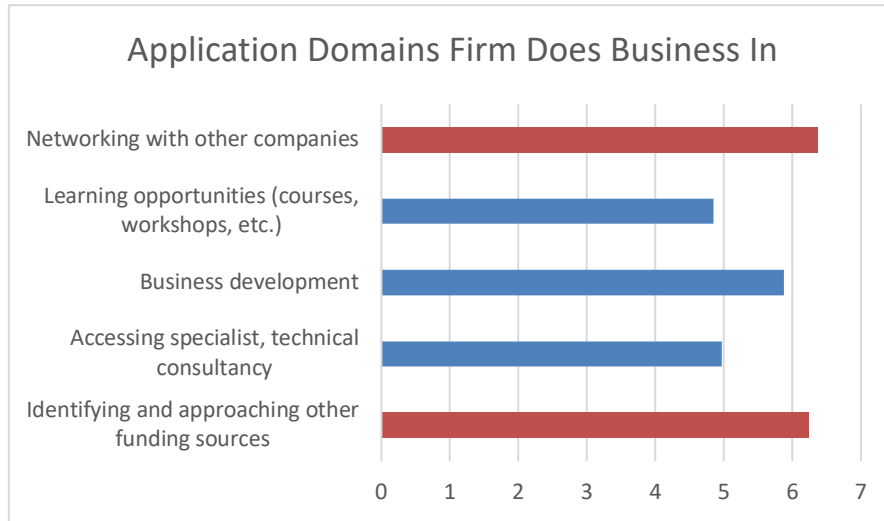
Figure 9 Statistics – Needs in Application Domains Accepted Firms Do Business In

3.4.1.2 *Application Domains Firm Wants to Do Business In*

The most common application domains in which the accepted firms want to do business are Industrial Automation, Sensors, Automotive, Aerospace, Smart Energy, Smart Cities, Smart Health and Construction. Most of the responses suggested that within the group of accepted firms there are firms working in the domains that other firms are eyeing to enter. In a few instances the responses implied that firms are not looking to move to new domains, but rather to entrench themselves more deeply into the same or very similar domains. As shown in Figure 10, in the application domains the accepted firms wants do business in they were mostly interested in networking.
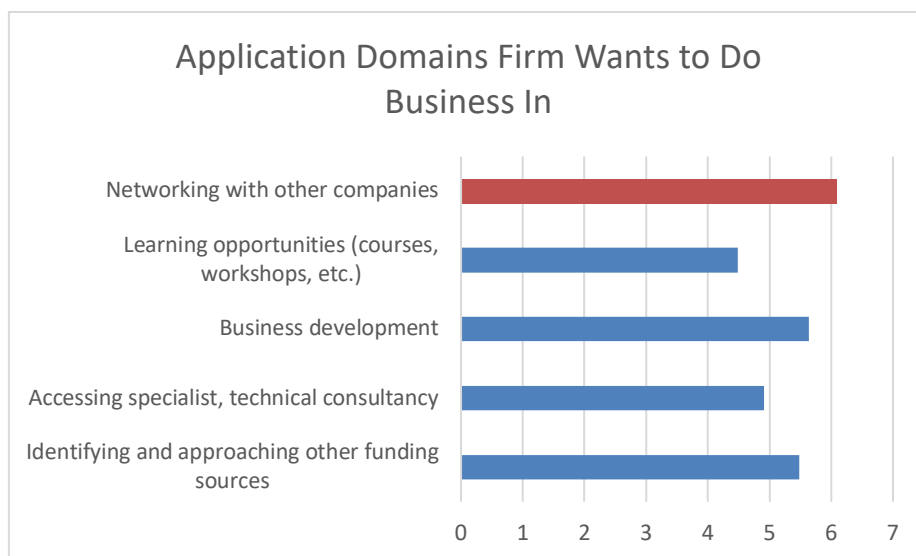

Figure 10 Statistics – Needs in Application Domains Accepted Firms Wants to Do Business In

3.4.1.3   Scientific Disciplines Which the Firm is Strong In

The most common scientific disciplines in which the firms are strong in are Computer Science / Data Engineering / Software Engineering, Mathematics, Electronics, Chemical Engineering and Control Theory. As shown in Figure 11, in regard to scientific disciplines the accepted firms are strong in they were mostly interested in research projects and novel technology.
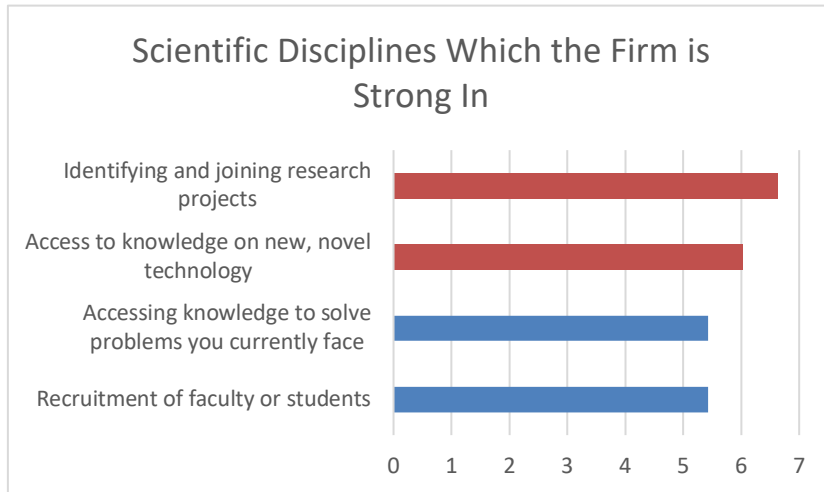
Figure 11 Statistics – Needs in Scientific Disciplines Which the Firms are Strong In

3.4.1.4   Scientific Disciplines Which the Firm Wants to be Strong(er) In

The most common scientific disciplines in which the firms want to be strong(er) in are all variants of Artificial Intelligence (AI), such as machine learning or reinforcement learning. As shown in Figure 12, the accepted firms were much less interested in acquiring additional support in regard to scientific disciplines they are not yet strong in.

Figure 12 Statistics – Needs in Scientific Disciplines Which the Firms Want to be Strong(er) In

4 DIH Ecosystem and Firms – Opportunities and Threats

Opportunities and threats are neither static, nor certain to exist. The added benefit from Task T2.2 comes from its ability to capture opportunities that would otherwise have gone unnoticed, and pave way for dealing with threats that would otherwise not have been mitigated. How this achieved, and what specific opportunities and threats were identified, are described in this section.

4.1 All Firms

This subsection describes the opportunities and threats identified from the responses of firms associated with both accepted and rejected proposals to the HUBCAP open calls. This analysis is the basis for the outcomes described in Section 5.

4.1.1 Analysis

The responses of firms in close geographical proximity to each DIH was summarized.

On the one hand, a *summative profile* for each firm was established based on their reponses. This was sentences short enough to be easily remembered by analysts, capturing the essence of what each firm focused on and wanted out of HUBCAP. This enabled the qualitative identification of common characteristics, which could be matched to the inventory of each DIH ecosystem. A few examples are given in Table 1.

Table 1 A few examples of summative profiles.

"Wants to diversify into more modes of transportation. Interested in most of the mentioned opportunities, but feel they have enough knowledge regarding their domains (regarding disciplines, they want to learn more on both core skills and AI though).
Interested in all opportunities. Note: No large difference between current/future domains/disciplines.
Wants to network with other companies and join research projects. AI is a special interest, which the company is not strong in by itself."
Wants support with funding, business development and networking. Technical interest is limited to new technology in Chemical engineering, Material Science, Computer science, Chemistry and Manufacturing process design and development. Note: Interested in joining research projects on several topics.

On the other hand, the *needs* of all firms in close geographical proximity to a DIH were *summarized* for each questionnaire category and according to high/low interest. An example of this is given in Table 2. Additionally, for each questionnaire category the domains and disciplines mentioned were summarized to identify strong synergies or outliers.

Table 2 An example of a needs summary

Application Domains, which the firm is doing business in already	Funding	Technical Consultancy	Business Development	Learning Opportunities	Networking

Very strong interest	6	1	5	3	8
Very low interest	3	8	4	6	1

This data was then cross-compared to the DIH ecosystem inventories to identify *opportunities* and *threats* for the firms and the DIHs. To exemplify, opportunities included domains that firms wanted to expand into that a DIH had strong competence or contacts within, a firm with a strong skill sought by others, a common need, etc. To exemplify, threats included firms focusing on soft skills that might go unaddressed by a technology-based action like HUBCAP, domains of itnerest unknown to the DIHs likely to engage with a firm, etc.

Finally, these opportunities/threats were discussed with representative for each DIH to ensure they were captured/mitigated.

4.1.2 Identified Opportunities

The following subsections describe the actions that were agreed with the DIHs based on the identified opportunities. Naturally these are the actions that were deemed both most interesting and most likely to yield fruitful results.

4.1.2.1   fortiss - Actions

1. Check the listed firms vs fortiss networking events, as there are synergetic events already planned for autumn but in German.
2. Invite the listed firms to the machine learning bootcamp and AI conference.

4.1.2.2   FBK/POLIMI - Actions

1. Check assets and profiles of NAMS SRL and SIMEVO SRL. They were awarded funding, so they will participate in workshops going forward.
2. Check the listed firms, interested in transportation, that are relevant to FBK and POLIMIT profiles.
3. Check the networking events listed by FBK and POLIMIT that will be attended and send information about these events to the listed firms.

4.1.2.3   ULBS - Actions

1. Contact business development contacts within ULBS and secure funding to enable the offering of business development skills to listed firms.
2. Focus on Smart Cities and Smart Factories. Ask the listed firms regarding joining research projects in those areas.
3. Be interface to firms interested in Smart Health domain, although own knowledge of domain is not strong.

4.1.3 Identified Threats

Two threats were identified as relevant when going forward with the proposed actions towards realizing opportunities. Firstly, that the language used in certain learning opportunities did not make it easy for everyone to join them. Secondly, that the DIHs did not always have a strong knowledge of the domains that the firms were active in or wanted to pursue. The former was highlighted to

fortiss. The latter was thought to be especially problematic for ULBS in regard to the Smart Health domain. Both AU and UNEW had strong contacts in this domain, which KTH contacted on behalf of ULBS.

4.2 Accepted Firms

This subsection describes the opportunities identified from the responses of firms associated with accepted proposals to the HUBCAP open calls. This analysis has been shared with the DIHs, and will be the basis for further action towards the end of the HUBCAP project.

4.2.1 Analysis

The accepted firms still operate in a very diverse set of domains, but there is more of a common base in Industrial Automation, Sensors, Automotive, Aerospace, Smart Energy, Smart Cities and Smart Health.

In these domains several firms are complementary in what they are doing vs looking to do, which might be both an opportunity (in case there is a possibility for cooperation through a diversity of business cases, geography, etc.) and a threat (in case they are, or might become, direct competitors). Nevertheless, there is a strong wish among the accepted firms for fruitful networking opportunities.

By and large the firms are more interested in growing where they are, rather than looking to new domains: most firms express an interest in securing further funding related to current strengths by for instance taking part in research projects; and most firms want to hear more about how to further strengthen the skills they already excel in.

This profiling was cross-compared to the most important services offered to firms by the DIHs, which were summarized in the D2.1 HUBCAP DIH Services deliverable. This allowed for the identification of opportunities that can be grasped jointly by DIHs. Threats were also identified, but widely interpreted as any mismatch between the needs of the accepted firms and the services seen as important by the DIHs.

4.2.2 Identified Opportunities

The following subsections describe the actions that have been suggested to the DIHs based on the profiling of firms that have been selected for funding through a HUBCAP open call as per May 2021.

4.2.2.1   VV, UNEW, AU – International Funding Assistance

VV offers a service called *"One Stop Shop"* in which they act as a single point of contact for interested industrial partners for initiation of research projects, UNEW offers a service called *"Assistance in Developing Proposals"* that enables SMEs to identify and apply for collaborative funding from local, regional and national sources, and AU offers a service called *"Grant proposal ramp-up and sharing pool"* in which proposals are coached and shared to foster idea exchange. These services are similar, but, naturally, rely on the research expertise within each DIH. Given that the accepted firms has provided their domains of interest, it has been suggested that the DIHs review these and approach those that match their knowledge. Alternatively, that they organise a small call for

information from those interested in using these services, and then sort through the responses to identify which firms match which DIH.

4.2.2.2   FBK, UNEW, KTH – International Networking

FBK offers a service called *"International networking"*, which contributes to strengthening the network of contacts by developing new international relations with public agencies, public and private companies, research centres and universities that can generate opportunities for collaboration and exploitation of the Foundation's research results. UNEW offers a service called *"Collaborator Identifier"*, which supports firms in identifying academic and other firm collaborators. Most other similar services offered by other DIHs are more focused on the hub-and-spoke model, in which a close collaboration is first established between the DIH and firm in question. KTH offers a service called *"Navigating the Ecosystem"*, which connects firms with national and international (European) organisations and companies. FBK, UNEW and KTH are very active networkers in the European research ecosystem concerning cyber-physical systems, it is suggested that they lead the other DIHs in organising networking events for the accepted firms or directing the accepted firms *en masse* to a larger networking event.

4.2.2.3   VV, KTH – Functional Safety Networking

VV offers a service called *"Functional Safety Community"*, which consists of a functional safety expert who is organising bi-monthly meetings for stakeholders from industry and academia interested in functional safety. Similarly, KTH organises expert groups, of which one is focused on functional safety. This expert group organises a conference each year, that largely focuses on networking opportunities for (functional) safety professionals. It is suggested that KTH involves the VV community in next year's (2022) conference to increase networking, possibly using a relevant HUBCAP theme.

4.2.2.4   POLIMI – World Manufacturing Forum

POLIMI offers a service called *"World Manufacturing Forum"*, which introduces firms to an open platform geared towards manufacturing that aims to enhance and spread industrial culture worldwide, as a means to ensure economic equity and sustainable development. Based on the large interest for industrial automation and manufacturing among the accepted firms, it is suggested that POLIMI advertises this service strongly.

4.2.3 Threats

It is difficult to provide skills development and training to SMEs, as these for instance often lack the necessary funds for such activities and are looking for cutting edge knowledge. There are many services related to skills development and training that are seen as important by the DIHs, and most of the accepted firms want to further hone their existing strengths. However, it is difficult to find a strong match in this area. The provided services are either generic, at a high level, or requires what is most likely extensive funding.

5 Further Developments

During the spring of 2021 fortiss, FBK/POLIMI and ULBS have acted on the identified opportunities. The subsequent subsections describe these activities.

5.1 fortiss

Some SMEs were introduced to fortiss for further collaboration and ecosystem building tasks. They were identified after the analysis by KTH and come from different backgrounds and domains (see Table 3).

Table 3 Proposed SMEs and their interests

SME	Country	Collaboration interest

Verum	Netherlands	• Networking and Funding
		    • Domains: semiconductor, railway, Smart agriculture, Medical devices
		• Accessing knowledge, Joining research projects, new technology
		    • Formal methods

CLEARSY	France	• Networking and Funding
		    • Domains: health, space, and autonomous systems
		• Accessing knowledge
		    • AI

Simevo	Italy	• Networking • Domains: industrial automation, power systems, smart energy, chemical industry, polymers production, AI
NAMS srl	Italy	• Networking and Funding • Domains: Industrial Automation, Aviation, Automotive, Robotics, Advanced Manufacturing
Simreka	Germany	• Networking and Funding • Domains: Chemical engineering, Material Science, Chemistry, Manufacturing process design and development, AI, 3D printing, Packaging • Technical interest is limited to new technology in Chemical engineering, Material Science, Chemistry, and Manufacturing process design and development.

Schlegel Simulation GmbH	Germany	• Networking and Funding
		    • Domains: system level modeling, computer science, applied physics, mathematics
		• New technology
		    • Machine learning

Agranimo	Germany	• Networking and Funding • Domains: Agriculture, Smart Cities
ContentWise	Belgium	• Interested in all types of support and interactions • Domains: Smart Healthcare, Consumer Technologies/Electronics, Space, Smart Cities, Smart farming/agriculture, Transportation AI, Mechanical Engineering, Electronics

Fortiss, in our role as representative of the Munich Innovation Hub for Applied AI, has contacted the above-mentioned SMEs with offerings based on their interests. The majority of the companies are looking for networking and funding opportunities to connect with innovators, providers, or investors. We have contacted them with the list of events[3] (mainly online webinars) at the DIH and our network. Moreover, we have promoted the HUBCAP online matchmaking events[4], which are essential during the current situation that face-to-face events cannot be held and there are not many networking and matchmaking events that are happening. One drawback that worth mentioning is that the majority of events at the DIH are in the German language which are beneficial to only a few of the contacted SMEs and limits the outreach. The language barrier also affected the SME CLEARSY from France, who are interested in learning opportunities in the area of AI and machine learning, while the fortiss Machine Learning Training Camp[5] is in German.

Another challenge is that the domains for which the SMEs are seeking support are not very well covered by the DIH. Only one company (Verum) that is looking for technological support in the area of formal methods fits nicely to the profile of fortiss. We have shared the current projects and tools developed by us in that area with the company to identify the possible area of collaboration.

Since the connection has been established with the mentioned SMEs, fortiss will further share information about future DIH events and will provide assistance and support for applying for open calls. However, there is a need for a platform (like HUBCAP) that has a list of DIH offerings for better communicating them to SMEs, and to ease the identification of the potential collaboration points.

5.2 POLIMI/FBK

In the context of the HUBCAP ecosystem building, the HUBCAP Italian DIH, composed by FBK and Politecnico di Milano (POLIMI), attempted to engage NAMS SRL and SIMEVO SRL, two SMEs that won the first HUBCAP open call. FBK and POLIMI envisioned the opportunity to present to the SMEs the services that each one is capable to offer and that could generate collaboration opportunities in the HUBCAP network.

With the goal of presenting the potential opportunities of development between the two DIHs and the two SMEs, one representative of each one of the institutions was present in the encounter. POLIMI presented the different specialization areas of its manufacturing group (i.e. Energy and Resource Efficiency in Manufacturing, Product Lifecycle management, Asset Lifecycle management, Social Sustainable Manufacturing, Manufacturing Services, Smart Manufacturing and Education in Manufacturing).

Then, the most relevant activities that could represent an opportunity for the two SMEs were presented, grouping them in the five macro-categories of services, i.e. the Data-Business-Ecosystem-Skills-Technology (D-BEST) model structure.

---

[3] https://www.fortiss.org/en/events
[4] https://www.fortiss.org/en/events/open-call-hubcap
[5] https://www.fortiss.org/en/events/machine-learning-training-camp-ml

Indeed, first the ecosystem building prospects that can be taken advantage of by being part of POLIMI's network were presented (here several consortia in which POLIMI takes part were shown). Then, the different technological opportunities such as the MADE competence center and the laboratory I4.0 of POLIMI were presented. Next, the business support (e.g. consortia building for project calls and involvement to open calls in ongoing projects), skills enhancement (e.g. the Digital REadiness Assessment Maturity model and the courses activated at various levels by the university in the Industry 4.0 domain), and data support (dashboarding, data analysis and KPI definition and assessment) that POLIMI offers were presented. In addition, the current evolution of the D-BEST model by adding the Remotization (R) dimension was also mentioned.

Lastly, POLIMI presented the method (based on the D-BEST model) to define the journeys of DIHs customers (technology users and providers), actually applied in several projects in the DIHs domain.

Furthermore, FBK presented their services centred on Model Based Design (MBD) in which it is specialized. The enhancement opportunities that MBD can offer in terms of complexity and cost reduction and quality improvement were presented. Lastly, FBK presented the main projects in which the DIH is collaborating that are involved with aerospace and railway industry.

From the presentations made by both DIHs, both companies expressed interest in certain research topics and projects. Both companies are interested in different technologies and services available in HUBCAP. In the case of SIMEVO, the major interest is centred on the development of broader networks focused on different technologies, and additionally, on joining research projects for technologies that the company is exploring. In the case of NAMS, the company wants to take more advantage of all the possible services that can be found in HUBCAP. It is more specifically interested in funding, business development, learning opportunities and networking. Additionally, it is interested also in developing new technologies for the company.

In particular, SIMEVO is a technology provider, for which the customer journey method presented by POLIMI was a highly interesting topic to be further explored. Furthermore, they specified their specialization in models for continuous industrial processes applied in thermophysical transformations for thermochemical, polymers and food processing for which some of the topics presented by FBK have a great potential to be an opportunity of further collaboration. More specifically, the topics that gathered their attention were the methodologies that FBK implements such as fault tree analysis, top event, etc., which in terms of risk analysis is aligned with their working areas.

NAMS is a start-up that initially developed for its business a digital marketplace for Additive Manufacturing (AM). Nevertheless, AM with time turned into a part of the operations and the company expanded their horizons to develop a digital platform that allows the collaborative and competitive collaboration between the different members of the AM field. The possible specialization areas of the participants in the platform vary from consulting services to printing services.

NAMS highlighted some of the areas where POLIMI performs research that were related with remotization and manufacturing experimentations. This because NAMS can offer a platform specialized in AM (or any other manufacturing topic), which for POLIMI could represent an

opportunity to collaborate with some projects that are being currently executed in circular economy (as FENIX). Finally, the last relevant point touched in the encounter was the relevance of considering the collaborations from a business perspective (funding and project development), this due to the fact that for NAMS, it is relevant that the association brings economic benefits for both interactors.

The ecosystem building activity executed by FBK and Polimi brought up several possible opportunities of collaboration with these two new partners of HUBCAP, as well as throughout the DIH ecosystem:

- to more precisely identify and systematize DIH services offered according to the models and approaches introduced by the HUBCAP project and related to the European Commission definitions (also related to the Digital Innovation Hubs Catalogue S3 platform[6]) would allow a better identification of potential customers in the existent (and not) networks and be more visible and recognizable at the European/international level;
- to promote the HUBCAP project at DIHs' local innovation systems, its open calls and DIH network (and related services) would allow to reinforce the existing networks and the possibility to enlarge them. Furthermore, explanations about MBD for cyber-physical systems to SMEs and innovators would help this process, facilitating the understating of possible applications and increasing the interest;
- to reinforce the collaboration between DIHs and their services with reciprocal sharing of information about services and research topics, applications and actions would allow both the planning of common actions, new common networking actions and the improvement/enrichment of the offered services.

Other opportunities will come from the HUBCAP Open Calls 2 and 3 winners, where the DIHs will have the possibility to support the SMEs in their experiments. In particular, FBK will follow the experiment of Developair, which involved an SME located in Trento, which had not yet approached MBD techniques and the related services provided by FBK.

Further exploration of the identified opportunities will be done before the summer of 2021.

5.3 ULBS

Based on the first open-call analysis conducted by KTH, the following SMEs were contacted via email by ULBS:

- Waveform j.d.o.o.
- Asti Automation
- SMM INVEST CO SRL
- PRODROMUS SP. Z O.O.
- Beam Innovation
- GreenRIS Developments

Email replies were received from Asti Automation, SMM INVEST CO SRL and Beam Innovation. Online discussions took place with each of these companies to know each other better (ULBS had

---

[6] https://s3platform.jrc.ec.europa.eu/en/digital-innovation-hubs-tool

no prior collaboration with any of them) and to find collaboration opportunities, such as joint projects, use of training or testing facilities etc.

Until the spring of 2021 no joint projects were submitted because limited number of calls at both European and national level were launched: only tentative pillars (e.g., Global Challenges & European Industrial Competitiveness), and topic clusters (e.g., 1- Health, 4 - Digital, Industry & Space, etc.) from Horizon Europe were preliminary discussed. Future collaboration in this regard on specific European Union-funded calls will rely on the expertise and interests of each SME as summarized in Table 4.

Table 4 Summary of collaboration interest

SME	Experience/Know-how	Collaboration interest with ULBS/DIH
Asti Automation	• Industrial automation using Siemens and BR technology • Providing training material as well as hardware in the field of automation technology	• Application of AI in automation • Training of its staff with new technologies through Research & Development projects in the field of factory automation
Beam Innovation	• Indoor and outdoor location solutions • Massive Multiple-Input Multiple-Output for communication in IoT	• Integrator for industrial automation solutions especially in agriculture • Blockchain
SMM INVEST CO SRL	• Remote maintenance solutions in any domain of application	• Integrator for industrial automation solutions / Supervisory control and data acquisition • Estimation of user's mental/emotional state

Moreover, in the context of the European DIH (draft) call in Digital Europe Programme, Beam Innovation was informed about the European DIH initiative in their vicinity - Wallachia eHub - in the SUD-Muntenia region of Romania, so they can be part and/or support that proposal.

Finally, Asti Automation and especially Beam Innovation were motivated to participate in HUBCAP's third Open Call – Innovate, which resulted in them working towards and being accepted for funding by HUBCAP in May, 2021.

Considering the interaction during HUBCAP and that no recent market study with relevant statistical data about the current needs of SMEs in Romania exists (regional and national), a survey led by ULBS will be conducted. The survey will focus the Central Region of Romania, to identify: the current digital maturity level, the SMEs ambitions in the field of digital transformation and which existing and/or new services the DIH should offer to SMEs (production, services, and commerce field). The survey will be launched in May 2021, expecting a broad SMEs reach (technology users and technology providers) as well as a good market overview for a better impact of ULBS in the field of MBD at a regional and national level.