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Problematizing the Service Portfolio of Digital Innovation Hubs [★]

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Abstract. Digital innovation hubs (DIHs) are a strategic means to drive European Small and Medium Enterprises (SMEs) digital transition. The European Commission has envisioned four main functions characterizing DIHs’ service portfolios (Test before invest; Support to find investments; Innovation ecosystem & networking; and Skills and training). However, DIHs target different functions, e.g. focusing on helping launch novel digital technologies to market, or directing investment opportunities. DIHs are also at different maturity levels, interact with different actors and exist in regions with different conditions for innovation. There might not be an equal need for all four functions, and they might not be equally well served. This research aims to explore and derive implications for the deployment of the four main functions by DIHs. It builds on the experiences from DIHs active since the beginning of the DIH initiative in several innovation actions, including FED4SAE and HUBCAP.

Keywords: Digital innovation hubs · Service portfolio · Innovation ecosystems

1 Introduction

Digital innovation hubs (DIHs) are entities that support European companies in the ongoing digital transformation of society. This support is provided in the form of services related to four categories [9]: (a) “Test before invest” (services related to technical expertise and experimentation); (b) “Support to find investments” (services related to brokerage between firms and funding organisations); (c) “Innovation Ecosystem and Networking” (services related to finding and supporting connections that enable or make innovation more effective); and (d) “Skills and training” (services related to ensuring that firms can access the training or adequately trained professionals they require for pursuing digitalisation).

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The European Commission (EC) has supported the establishing of DIHs since 2014, primarily through funding projects in the Horizon 2020 EU Framework Programme for Research and Innovation.

DIHs thus form the nucleus in a growing number of public-private innovation ecosystems, i.e. interconnected production and user side organisations of both public and private character that under the direction of a lead organisation together focus on the development of new value through innovation [2,1].

While innovation ecosystems are gaining an increasing amount of attention, the concept itself [12], how they get started and grow successfully [6], and the associated implications of public-private cooperation [1] are understudied. Which actions public actors should take during ecosystem genesis to ensure that an innovation ecosystem thrives is unclear. The four categories relate to activities necessary for successful ecosystem growth that typically fall under the responsibility of different roles, such as the provision of advice by experts (“Test before invest”) and the forging of partnerships by ecosystem leaders (“Innovation Ecosystem and Networking”). Different DIHs will strive to fill different roles, either by choice or to ensure a fit with their current capabilities.

DIHs might thus, rightfully, not strive to address all four functions, and they might have to address them differently. This paper aims to problematize the DIH deployment of services according to the four main categories, exploring difficulties for DIHs in providing services in one or several of the categories.

2 Related Work

Organisations participate in innovation ecosystems for different reasons [10,11]. Depending on whether they are public or private, they often enter into innovation ecosystems either from central positions in knowledge or business ecosystems [8,14]. That said, many areas that used to be the responsibility of either public or private organisations have become shared [7], and the increased public-private collaboration in innovation ecosystems is a part of enabling this shift.

However, this collaboration is not without friction. Firstly, the basic culture and character of the work outputs of firms and academia usually differ to the extent that it can introduce problems when cooperating [5,13]. Secondly, the reasons for participating in an innovation ecosystem can also mean that organisations choose to take on specific roles. Focusing on a leadership, direct value creation, value creation support or entrepreneurial ecosystem role [6] will provide opportunities and enforce limitations. Thirdly, the governance of innovation ecosystems is often supported by platforms that constrains the evolution of technology and services [3]. The control of such platforms, and associated non-pricing instruments, can be critical to avoid innovation ecosystem failure [4].

3 Methodology

This paper builds on the experiences from several DIHs. Each category is approached using data sets gathered by the authors during Horizon 2020 innovation

actions associated with the DIH initiative. This section discusses the associated data gathering, data analysis, and associated validity concerns.

3.1 Test before invest

The data associated with this category comes from the HUBCAP innovation action, which started in 2020 to bring together an innovation ecosystem around a collaboration platform⁴ to facilitate the use of model-based design technology for cyber-physical systems (CPS). The collaboration platform provides a web application that features a collaboration environment (consisting of an enterprise social software) enhanced with a sandbox (a cloud-based solution catering tools and models in a ready to use virtual environment).

The first data set comes from a survey integrated on the collaboration platform to obtain immediate feedback from users on its usability and limitations. Responses were thus gathered from an initial population of small and medium-sized enterprises (SMEs), which had partnered with HUBCAP and gained access to the platform.

The second data set comes from the 8 DIHs in HUBCAP, and consists of a summary of the innovation support services they provide. This summary was gathered through contacts with a central member from each DIH. These central members wrote down a list of the most important services provided by their DIH. Then the types and descriptions of the services were harmonized by a single investigator. The result was reviewed by two independent investigators to identify mistakes and inconsistencies in the harmonization.

3.2 Support to find investments

The second data set from the previous category is used also here. Furthermore, the contacts providing funding opportunities to the 8 DIHs were also collected and documented. This contact information was gathered through iterations with several members of each DIH, in which these were asked to describe: (a) the organisations that are part of their ecosystem; (b) their relationships; and (c) the associated learning, networking and funding opportunities. Finally, 7 ecosystems were mapped out with enough quality to be useful for comparative purposes.

3.3 Innovation ecosystem and networking

The data associated with this category also comes from the HUBCAP innovation action, and its effort to build a network of DIHs interesting in leveraging their local ecosystems. To foster the ecosystem building and networking HUBCAP set up an open call programme with multiple trickle-down funding calls. Before each call a number of open workshops and Q&A sessions brought SMEs together, creating opportunities for new partnerships. The data set for this category was collected by asking each DIH in the network which of the SMEs that were funded by first two open calls that were also new to the ecosystem.

⁴ <https://dihware.eng.it/dihwelcome/>

3.4 Skills and training

The data associated with this category comes from the FED4SAE innovation action, which between 2017 and 2021 aimed to lower the technical and business barriers for innovative companies in the CPS and embedded systems markets. As part of this project 8 DIHs were asked to provide details on the public and private organisations in their innovation ecosystems, their relationships and their ways of upskilling their employees. After networks maps for the knowledge and training relationships had been established, the firms seeking to join the DIH innovation ecosystems through FED4SAE were approached for interviews. Out of a 100 such firms, 20 were interviewed for about 20 minutes each by two interviewers. An interview script focusing on learning opportunities and the skill set of their employees were used to ensure a coherent coverage across all interviews. As both the questions and number of interviewees were limited, the interviewers created summaries of the replies for each question during the interviews. These summaries were then used to discuss each question in separation when all interviews had been concluded.

4 Results

The detailed results from the survey on the initial HUBCAP industry experience⁵ and the summary of innovation support services⁶ are available in separate reports.

4.1 Test before invest

In regard to the survey, respondents were overall satisfied with the platform. Nonetheless, 40 percent declared that the platform limits features of the asset deployed to it, as a cloud-based/virtual machine always has limits that a directly accessible, physical machine does not have in terms of hardware, software, or licensing. In some cases, this meant that only part of the features of the assets provided by the initial population of SMEs were feasible to deploy.

In regard to the summary of available services, Table 1.i describes the number of “test before invest” services provided by the investigated DIHs. The DIHs provided “test before invest” services aimed at providing (a) physical, exceptional testing and validation equipment, (b) demonstration facilities, (c) insights and training on novel technology, and (d) collaborative research.

4.2 Support to find investments

Table 1.ii describes the number of funding services provided by the investigated DIHs, and the funding opportunities that they perceive in their ecosystem. Only the 7 DIHs which were possible to map with a good enough quality are included.

⁵ D3.2 https://www.hubcap.eu/assets/res/files/D3_2.pdf

⁶ D2.1 https://www.hubcap.eu/assets/res/files/D2.1_DIH-Services.pdf

The DIHs provided funding services aimed at (a) helping other organisations write competitive research proposals, (b) providing direct financial support in e.g. open calls, and (c) building business and innovation skills.

4.3 Innovation ecosystem and networking

Table 1.iii describes (a) the number of proposals that were accepted in the two calls, and (b) how many of these were already known to the involved DIHs.

Table 1: Data collected for the DIH functions

(i) Testing		(ii) Funding			(iii) Networking		
DIH	Testing Services	DIH	Funding Services	Ecosystem Funding Opportunities	Open Call	Number of Accepted Proposals	Previously Known SMEs
1	2						
2	0						
3	2	1	1	13	# 1.1	21	4
4	3	2	1	9	# 1.2	14	3
5	1	3	0	14			
6	1	4	0	1			
7	1	5	1	5			
8	1	6	3	12			
		7	2	11			

4.4 Skills and training

The network maps for the knowledge and training relationships in the FED4SAE innovation ecosystems indicated that the learning opportunities deemed most important by the innovation ecosystem participants could be divided into preparatory and continued education. The former preparing professionals for employment, and the latter meant to provide upskilling during their careers. Important preparatory education was carried out by the (primarily academic) partners which were part of the nucleus of the innovation ecosystem. However, important continued education was almost exclusively provided by peripheral organisations or initiatives that were only open to paying members.

The interviews probed the implications of the network maps, as these indicated that SMEs would struggle to access advanced continued education. However, most SMEs indicated that they had a close relationship with academic institutions, for instance through founders that were formerly, or even currently, employed within academia. Through these informal relationships they were able to access both knowledge, learning opportunities and experiment facilities related to advanced state-of-the-art research at low or no cost. In fact, even if continued

education would have been accessible through more formal relationships, the SMEs would struggle to pay for it. The solution to accessing necessary skills was thus seldom upskilling, but rather recruiting someone who already possessed the right set of skills.

5 Discussion

This section discusses the results from the perspective of problematizing the DIH deployment of services.

5.1 Test before invest

The most important “Test before invest” services identified by the DIHs are centered on the DIHs themselves. They involve firms collaborating with DIHs through a hub-and-spoke collaboration model. In contrast, the HUBCAP collaboration platform is based on point-to-point collaboration between firms. One of the most important aspects of a central platform in an innovation ecosystem is the control that it gives ecosystem leaders. By constraining technology and services, leaders can avoid low quality that might turn away potential users. However, ecosystem leadership must then be prepared for actively using non-pricing instruments, such as legal agreements, licenses, and oversight, for this purpose. It is then noteworthy that survey respondents mentioned that only part of the features of some platform assets were feasible to deploy. This might be acceptable, but it might also lead to users becoming frustrated with the digital format. DIHs that are not directly involved in “Test before invest” service transactions, should still not dismiss their part in ensuring that these transactions can be completed smoothly. Therefore, even if the services provided by firms are only intended to demonstrate the functionality of their products, this has to be framed correctly to give users the right impression.

5.2 Support to find investments

Many funding services in the innovation ecosystems, and especially those focused on enabling firms to *separately* apply for funding, were not emphasised by the DIHs. The culture and character firms and academia differ, most likely making DIHs as ecosystem leaders lean towards funding opportunities that firms can explore in synergy with the research focus of academia.

However, SMEs are often very focused on identifying funding to grow opportunities from early discovery to sustainable business. This suggests that DIHs should increase their emphasis on brokering funding that targets also higher technology readiness levels.

5.3 Innovation ecosystem and networking

The results suggests that the open calls enabled many new SMEs to enter the DIH innovation ecosystems. Unfortunately, this is not only positive. DIHs might

be unable to collaborate smoothly with firms they are not familiar with, since they can for instance be active in application domains unknown to the DIHs.

An online collaboration platform, like that of HUBCAP, could possibly ease such collaboration difficulties: as collaboration is built upon point-to-point relationship, such platforms can allow networking firms to tie other DIHs to their original innovation ecosystem. In other words, these platforms can allow SMEs to build networks of DIHs able to jointly support their specific needs.

5.4 Skills and training

It is positive that the interviewed SMEs do not have difficulties in accessing the advanced training they need. However, it appears as if this access is dependent on personal contacts within academia. DIHs should work towards also formalizing this access to training, to ensure that it is provided on a fair and equal basis. However, if not supported by authorities or funding agencies, such formalization would probably come with a price tag. This would probably also render the training inaccessible to most SMEs. One way of overcoming this obstacle could be for DIHs to work towards securing a training budget in other activities that involve novel technology. This could for instance be other services, such as those within the “Test before invest” category, or the trickle-down funding of open calls.

6 Conclusions

This paper aimed to explore and problematize the DIH deployment of services according to the four main categories defined by European commission. Two main networks of DIHs have been considered.

The results highlight limitations of DIHs based on their strategies and emphasis when providing services. This emphasis is the prerogative of the individual DIH, but it should involve informed choices.

With research institutions as innovation ecosystem leaders, the most important services for supporting SMEs to find investments become those focused on exploiting synergies with research. Although this is in line with the primary needs of public, especially academic, institutions, such DIHs should not forget to put effort into brokering funding that targets higher technology readiness levels. Similarly, higher education and research institutions found in the centre of knowledge ecosystems, and which might easily become important stakeholders in innovation ecosystems, might not emphasise their continued education enough to provide formal pathways to it. To avoid a skewed training provision such DIHs should ensure that such pathways are created, and that these do not incur costs that prohibit SMEs from using them.

Furthermore, platforms as a basis for collaboration is an important aspect of many private innovation ecosystems. Collaborative platforms can most likely be a strong means to empower DIHs in supporting the digital transformation of SMEs. An obvious opportunity is that they can allow SMEs to build networks of

DIHs ably to jointly support their specific needs, as collaboration can be built on point-to-point relationships rather than the hub-and-spoke collaboration model. However, DIHs must still ensure that a collaboration platform is not filled with services and artefacts with low quality. This might require the use of non-pricing instruments, such as licensing and oversight. These might not be well understood by DIHs run by research-focused organisations, which suggests that these DIHs should be especially careful when deploying services via digital collaboration platforms.

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