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Learning across silos: Design Factories as hubs for co-creation

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Abstract

Collaboration through innovation is central to the discussion of how today's universities can respond to new interdisciplinary challenges, competitive environments and stakeholder complexity. Innovation hubs represent a dynamic example of how the public sector, including higher education, is responding to the need for new methods and perspectives that foster desired intra-institutional change. This study examines one of these types of platforms, the Design Factory Global Network originating at Aalto University, in order to shed light on key enablers and barriers to furthering collaborative efforts within higher education. Based on 25 in-depth interviews with 17 Design Factories, including perspectives from students, staff and educators, the findings show that institutional policy fostering flexibility, securing a physical cross-disciplinary and multi-purpose collaborative space, upper level support and building community are all vital in ensuring design-driven experimentation that contributes to the effectiveness of higher education.

1 | INTRODUCTION

Innovation is often at the centre of discussions on furthering societal efforts for new and multidisciplinary problem-solving, whether linked to economic change, social adaptations, or educational tools. It is ever-present in today's diverse efforts to improve daily life, as complexity, competition and the pace of technological change

increase. Hence, reacting effectively in this environment of innovation becomes central to ensuring one's place in a continually developing and highly interconnected society (Noweski et al., 2012).

Linked to the goal of innovation is the need for collaboration, insofar as it can provide practical value through diverse perspectives (Sato, Lucente, Meyer, & Mrazek, 2010). Today's innovation comes through collaborative channels and networked creativity that often require navigating challenges that are linked to interdisciplinary approaches and the dynamics within teams (Koria, Graff, & Karjalainen, 2011; Lockwood, 2009). Acting as innovation hubs for wider-scale benefits, universities are uniquely positioned to create and spread valuable knowledge that includes, but is not limited to teaching and research efforts (Du, Leten, & Vanhaverbeke, 2014; Giuliani & Rabellotti, 2012; Gunasekara, 2006). With interdisciplinary efforts to foster effective learning and the connections created there, universities shape the future and can be birthplaces of innovation and civil progress (M'Gonigle & Starke, 2006). Notably, they are in a state of transition, as increasing student diversity, new educational and facility-based technologies, private sector partnerships and evolving private and public stakeholder demands linked to funding, research outcomes or educational performance motivate new and more effective approaches (Heaton, Siegel, & Teece, 2019) in providing an infrastructure of knowledge that enables vital innovation (Asheim, Smith, & Oughton, 2011; Guerrero, Cunningham, & Urbano, 2015). Universities, industry and intermediary agents are collaborating to create opportunities by minimising the distance between stakeholders and maximising knowledge flow (Heaton et al., 2019). However, the ability to react to necessary changes and the desire to adapt to evolving private and public sector partnerships or desired outcomes are key challenges for higher education (Drew, 2010; Hanna, 2003) which can result in a disconnection from institutional self-awareness and needs within the university (Larsen, Maassen, & Stensaker, 2009). A lack of autonomy of innovative units and faculties inside a higher education institution and the ability to reach across silos can limit potential innovation (Larsen et al., 2009; Meister-Scheytt, 2007).

One avenue for increasing collaboration effectiveness across silos, fostering autonomy in innovative units and encouraging creative approaches outside traditional institutional frameworks was found in design thinking, which can be defined as an approach, tool, or culture for user-centred creative problem-solving and innovation through experimentation (Micheli, Wilner, Bhatti, Mura, & Beverland, 2019). Design thinking has attracted considerable attention from both industry and the public sector because of its provision of tools that enable innovation whilst taking advantage of well-established expertise (Heaton et al., 2019; Kurokawa, 2013; Liedtka, 2018; Micheli et al., 2019). A number of universities and public sector innovation labs alike have sought new paths to innovation and student development by combining design thinking with interdisciplinary collaboration (Heaton et al., 2019; Kurokawa, 2013; McGann, Blomkamp, & Lewis, 2018).

However, the challenge remains as to how to incorporate design-driven, interdisciplinary collaboration in higher education institutions and their ecosystems. What types of practices and structures enable and hinder the development of such initiatives? This study examines experiences at Aalto Design Factory and in the Design Factory Global Network—27 transdisciplinary (Gibbons et al., 1994) co-creation hubs around the world to illustrate how collaborative platforms can be used to innovate across disciplinary silos. We also delve into the institutional implications involved in innovating collaboration and identify key factors to consider when designing policies to promote and support such initiatives, with implications for public-private sector collaboration and student innovation.

2 | DESIGN THINKING, COLLABORATION AND THE PUBLIC SECTOR

In the last decade, design thinking has become a strategically valuable tool to form a holistic understanding of a specific problem and develop solutions that are desirable, viable and feasible (Brown, 2008). The lack of consensus on the definition of design thinking reflects the non-linear nature of design processes, as well as the constant growth of “design” activities that expand the boundaries of design practices (Micheli et al., 2019). This article adheres to the notion of design thinking as a user-centred, action-oriented approach to creative problem-solving originating from the design disciplines, but one that can be learned and used regardless of disciplinary

background (Micheli et al., 2019). Design as a discipline is systematically moving closer to users, bringing in co-creation between those who develop the outcome and those who produce and use it (Sanders & Stappers, 2008). Participatory design can be used to democratise the innovation process through collaborative partnerships and co-construction which broaden the scope of beneficial change to people, practices and organisations linked to the end product (Gregory, 2003; Richardson, 2016).

The need for the public sector to continue to innovate approaches and associated outcomes has led to incorporating design thinking in the infrastructure of some public institutions (Carstensen & Bason, 2012). The practicality of design thinking for improving process issues and the desire for more evidence-based outcomes have fuelled a rise in public sector innovation (PSI) labs where experimentation based on design thinking is leveraged to improve public sector processes and outcomes. Notably, the demand for this combination of design methods and evidence-based expertise has resulted in over 60 PSI labs in the EU, with other labs on other continents (Fuller & Lochard, 2016; McGann et al., 2018). Design thinking in these labs offers a reinvention of public sector efforts by refocusing it away from a positivist perspective to one that includes diverse values, norms and forms of evidence, for example in assessing policy effectiveness from multiple perspectives (Rebolledo-Bustamante, 2016). Indeed, one of the primary benefits of PSI labs in this design thinking context has been a shift in decision making to a more networked and inclusive model (Bason, 2013). PSI labs use design thinking to combine negotiation and relational approaches to problem-solving in social contexts that are closely interconnected and where technical solutions may not be possible (Head, 2008).

The efforts to leverage design thinking in higher education mirror those of PSI labs in many ways. Notably, the university environment is particularly rich in collaborative potential, given the capacity for multidisciplinary teams that facilitate valuable competing and complementary approaches (Drews, 2009; Koria et al., 2011). Here, the potential of disciplinary tools that are relevant for key processes can be more fully realised through new cooperative efforts based on design thinking (Sato et al., 2010). Balancing an outcome focus with process flexibility and creativity, whilst being closely linked to institutional structures, is part of integrating new approaches to well- established organisations. However, the proximity of design thinking initiatives to well-established institutions with and within which cooperation is sought can be challenging (Mulgan, 2014). Collaboration can result in tensions between some ineffective rigid ways of thinking or doing and the design-driven goal to innovate and develop alternatives that challenge an established *status quo*. At the university level, obstacles to collaborative potential can be orientation-related, such as conflicting organisational or unit incentive systems, and transactional, such as power relations between participants, responsibility, authority and trust (Bruneel, d'Este, & Salter, 2010; Youtie & Shapira, 2008). Embedding design thinking initiatives in excessive proximity to more powerful rigid structures may result in a marginalisation of new design outcomes, leading to incremental change rather than to radical shifts, despite direct contact with influential stakeholders (McGann et al., 2018). Excessive distance from influential structures, in turn, will limit the impact of new initiatives on institutions. This tension between bringing in new innovative practices through contact and contextual expertise in well-established institutions is a key issue in determining how effectively design is implemented in higher education.

3 | METHODS

In order to examine what type of support enables and is required for design-driven platforms to successfully collaborate in higher education institutions, we conducted a case study of Design Factories as change agents that promote design-based learning for innovation in higher education. Qualitative case studies fit well with dynamic processes where the boundaries of the phenomena are not clear-cut and where the focus is on the interaction between actors and their environments (Eisenhardt & Graebner, 2007; Yin, 2003).

We build the case study on an empirical study of 25 in-depth interviews of actors from 17 of the 27 Design Factories within the Design Factory Global Network (Figure 1) and participant observations, with two of the authors being co-founders of the Aalto Design Factory in Finland and having over a decade of experience each in developing the co-creation hub. The 25 interviewees represent three main sectors of involvement in a Design

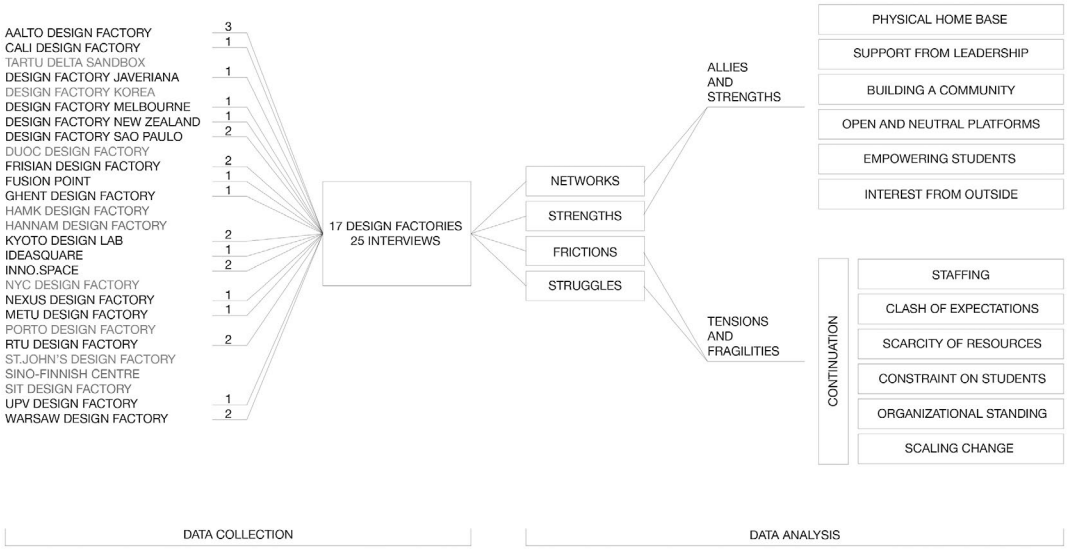

FIGURE 1 Data sources, analysis and resulting categories. *Source:* Authors

Factory from its home institution, namely students, staff and educators. The semi-structured, thematic interviews focused on experience with the local Design Factory, its relationship to its home institution, the ecosystem around their Design Factory and the global network of other Design Factories. In addition, the interviewees were asked about critical incidents in advancing change—these represent participant-selected examples which are more likely to be recalled accurately and experienced as meaningful by the interviewees (Chell, 2004; Cope & Watts, 2000). Most interviews were conducted through videoconferencing and all were audio-recorded and transcribed. Their average duration was 30 min. The resulting narratives focused on the development of Design Factories within their own context, discussing the phases that they go through and highlighting the allies, struggles and fragilities being faced. These narratives were analysed inductively, categorising responses based on a semantic-level thematic similarity (Braun & Clarke, 2006) of the networks, and strengths, frictions and struggles of Design Factories as change agents. This resulted in six categories of allies and strengths and six categories of areas where tensions between the platform and structures of the home institution created fragilities (Figure 1). These self-descriptive categories are key results (Butterfield, Borgen, Amundson, & Maglio, 2005) that characterise commonalities in the development of the platforms across varied ecosystems.

4 | DESIGN FACTORIES AS CHANGE AGENTS FOR CO-CREATION

The desire for more open, design-driven collaborative efforts for innovation has been recognised in the public sector for some time. In 2007, there was an aim for an "innovation university" in Finland which would merge the leading technology, business, and art and design universities. The resulting Aalto University quickly became a forerunner in European university reform, nurturing ways of working across boundaries and acting as a flagship for the larger scale development of higher education and innovation systems (Green, 2009; Kao, 2009; Markkula & Lappalainen, 2009). Although Aalto's operations began in 2010, reforms and preparations began before this. One of the first initiatives to increase collaborative experimentation in the soon-to-be-formed university was the Design Factory (designfactory.aalto.fi). Founded in 2008, prior to the official decision to proceed with the university merger, it is an interdisciplinary platform for experimentation and promoting experiential, student-centred hands-on pedagogy (Björklund, Nordström & Clavert, 2013). During its decade of operations, it

has come to play a crucial role in its regional innovation ecosystem and represents an internationally-renowned benchmark (Reichert, 2019). Aalto Design Factory is an operating model for co-creation and a physical, 3,000 square metre building split into three parts, namely flexible teaching spaces, prototyping facilities and co-working spaces for students, teachers, researchers, entrepreneurs and industry representatives (Björklund, Laakso, Kirjavainen, & Ekman, 2017, see also Figure 2). Students are treated as full members with, for example, around-the-clock access key cards, the possibility to book meeting rooms and access to their own storage spaces. The platform hosts 30 to 40 courses annually, combining theory and practice by encouraging student-centred, passion-based and design and problem-based learning. The most common activities centre around project-based courses, with multidisciplinary student teams working on design briefs from external sponsors. Many of these courses such as the Product Development Project (pdp.fi) and ME310 Global Innovation Program (me310.aalto.fi) include international collaboration.

In 2010, the second Design Factory was established at Tongji University in Shanghai, China. Since then, the Design Factory has expanded into a global network of 27 Design Factories across the globe (dfgn.org). The organisational locations and operational models vary to suit local conditions, but the principles concerning the ways of working remain consistent. Each Design Factory strives to be a change agent, with the local institutions and ecosystem promoting a culture of experimentation and collaboration with diverse stakeholders. However, change agency inevitably encounters friction with existing practices, structures and culture. We strive to understand which factors in the platforms and their home institution and regional ecosystem enable and hinder design-based learning for innovation in a wide variety of local conditions with interview data from 17 Design Factories in different institutions worldwide (Figure 3).

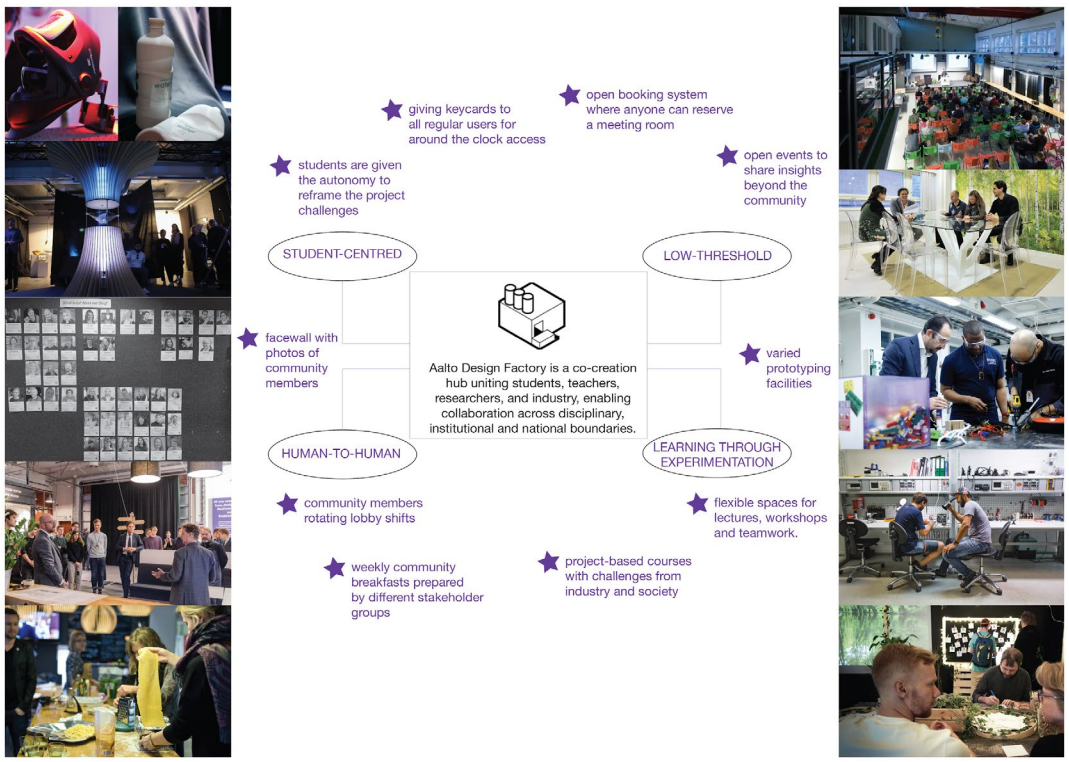

FIGURE 2 The Aalto Design Factory interdisciplinary co-creation platform. *Source:* Authors [Color figure can be viewed at wileyonlinelibrary.com]

FIGURE 3 Interviewed institutions with Design Factory co-creation platforms. *Source:* Authors

4.1 | Allies in change: Relationships with and within the ecosystem

The Design Factories facilitate complex networks of stakeholders, including students, researchers, teachers, administrators and leaders in different majors, departments, schools and universities. These networks also include external stakeholders, namely entrepreneurs, industry, NGOs, municipalities and governmental agencies, funding agencies, as well as other educational and research institutions. We found six common sources of strength across Design Factories: the physical platform, leadership support, building a community, empowering students, openness, and leveraging external interest.

The core community of a Design Factory is typically made up of staff, students, teachers, researchers, entrepreneurs and others who work in the physical Design Factory on a regular basis. While collaboration spans across institutions and geographies, having a ***physical home base*** and a tangible showroom has been crucial for both the users of the Design Factory and the staff's change agency (see also Table 1). All the interviewed Design Factories, including those that do not yet have their own facilities, mentioned the importance of having a home base that functions as the core of the community. The facilities allow students to work with and store the prototypes they produce in courses and teachers have reported easier active learning when configuring classrooms flexibly:

> Before we didn't have any location where students could come and work, a place that was really inspiring and not like the typical classroom with fixed furniture but more flexible space. That was one of the first things we did together starting up the Design Factory. Students mention that they really love the space, everybody wants to use it for things that are absolutely not related to design thinking or entrepreneurship. (Founder of one of the Design Factories)

The facilities also enable potential allies to experience the innovative platform first-hand, such as university leadership visiting student project prototype exhibitions where the energy and enthusiasm are powerful arguments for such platforms.

Indeed, securing sufficient ***support from university leadership*** can be crucial for Design Factories. As the co-creation hubs span across silos, Design Factories cannot be tied to any one pre-existing major or department. In many cases, deans, rectors and presidents can be vital allies. For example, at Aalto University, early and continued support from the president, vice presidents of education and external relations and the dean were key enablers for

TABLE 1 Examples of change tactics related to the common strengths of the Design Factories

Aim	Example of change tactic employed by staff
Establishing physical premises	In the beginning, one of the Design Factories had to hijack empty university spaces to organise workshops. Once they joined the Design Factory Global Network, the formal international connection brought government-level recognition. This helped to secure the necessary budget to create their own digital fabrication labs as a part of supporting global academic networks, enhancing international knowledge exchange
Gaining leadership support	Reviewing pre-existing objectives at their home institution, one Design Factory noted that faculty was being restructured in the formation of a new master's program around innovation. They successfully lobbied for adding content from the Design Factory as two new pathways within the new degree around entrepreneurship and co-creation. Already having the necessary staff and skill sets for this new programme allowed the Design Factory to proactively display their hands-on mentality and relevance for university strategy to upper management
Building the community	Experimenting with different communication strategies to see how they could grow their community, one of the Design Factories tried casual meet-ups using social media channels and organised lunch-time design sprints, which all increased the number of the students involved in their courses. Notably, sending personal emails to all second-year students who had a B+ grade or better, personally inviting them to be part of the Design Factory, was the most successful strategy

Source: Authors.

accommodating and funding an initiative that did not fit into existing structures. Interviewees from all 17 Design Factories mentioned the effect that the support (or lack thereof) from leadership in their home institution had on the platform (see also Table 1). Additionally, external highly-positioned allies in city councils, municipalities and chambers of commerce were mentioned by a majority of the interviewees. Ten Design Factories attributed their financial situation to the level of support from leaders and seven to their ability to maintain prototyping spaces:

> I think having people in the upper management, having real buy-in from them, is really important, like having somebody who will argue on your behalf when things come up, and that they understand it and they can do it. (Director of a Design Factory)

However, while support from the top is needed, it is typically neither the starting point nor sufficient in itself for co-creation hubs. Staff in Design Factories systematically mention dedicated teachers, students, student associations, incubators and external collaborators as key allies. ***Building a community*** around Design Factories is a key strategy for advancing change. Interviewees in eight of 17 Design Factories reported the community as the element that "*holds everything together*" and underlined the continuous effort to develop their community. The community engages in initiatives, creating tangible, visible wins to advance a cultural change towards greater collaboration and experimentation. (see also Table 1)

Design Factories also strive to be ***open and neutral*** platforms. Neutrality is never fully possible, as stakeholders link Design Factories with their staff, home departments, allies and so on. For example, Aalto Design Factory has its organisational roots in engineering design, and whilst transdisciplinarity is a basic principle in the platform, this history has sometimes increased the threshold for new design and business students and staff to approach the community. Here, informality makes boundaries across silos and stakeholders less visible, which is combined with welcoming anyone's small experiments on varied topics. Rather than placing a few large bets, they focus on lowering the initial threshold for attempting co- creation:

> It is a strategy to just have a functioning communications and facilities, and then, still leave big enough opening for people to actually figure out what they wanna do with what they have. It sounds a little bit ambiguous, and it is a gamble, but essentially, that's how it should be. (Technical employee at one of the Design Factories)

Whilst relevant for encouraging co-creating amongst staff and external stakeholders, these principles become particularly important for tapping into the potential of students. ***Empowering students*** to work on their projects outside of courses can result in vocal proponents, spin-off companies and future company sponsors. Students have consistently noted that the main attraction of the Design Factory was the energised atmosphere and the community that allowed exploration. The strong relationships that students build with the Design Factory contributes to an ever-growing community that can reach past graduation, with one Design Factory even being largely funded by an alumni network:

> We get most resources from an alumni association from former students which provide grants for the [capstone] projects and we almost every year we get the necessary resources from them, including the fees that we pay for the Design Factory Global Network is coming from this alumni club. So we have legitimacy coming from the students using [our platform]. (Founder of one of the Design Factories)

Finally, one should not underestimate the combined effect of weak external ties. ***Interest from outside the home institution***, whether from companies, municipalities, governments or other universities can legitimise new ways of working. 14 out of 17 Design Factories mentioned the positive impact of having these external interests. For example, Aalto Design Factory hosts over 1,000 visitors each year who are interested in learning from the Aalto University ecosystem, including high-profile visitors such as presidents, prime ministers, and royalty. The Design Factory Global Network demonstrates the appeal and viability of the approach globally for all the platforms. It is seen as an important contributor to branding, legitimacy and continued interest in the platforms locally.

4.2 | Frictions between Design Factories and their ecosystems: Sources of fragility

We found that ***continuation*** was an underlying theme in most of the struggles reported by different Design Factories. In the interviews, 13 Design Factories emphasised their ongoing struggle to legitimise the platforms which have typically been experienced as fairly grassroots activities, initiated by a few enthusiastic teachers and a tenured professor or leader with a sufficient mandate to initiate changes in courses and facility allocations. These small wins can act as powerful showcases, helping to bring others onboard. However, there is a tension between iterative, fast-paced, design-driven efforts of the Design Factories and the traditional structures of the home institutions. These are seen in challenges in six areas across the co-creation platforms: staffing, collaboration, resourcing, students, facilities and organisational standing, and scaling change.

The first group of tensions is reflected in ***staffing*** Design Factories. For continued funding and retention of staff, many Design Factories need to fulfil traditional performance indicators. 25 operate in universities where research merits and publications are heavily emphasised in evaluations, but Design Factories require significant time and energy for development, co-creation and community building, which can lead to unsustainable workloads. Having to combine criteria of the traditional home institution and the platform can create dependencies on specific individuals with enough legitimacy and passion in both arenas (see also Table 2), introducing fragility to the platforms: if these key individuals leave, the platforms can disintegrate:

> Our relations with the industry and incubators are very fluid and very positive and reinforcing. But they are rather informal. So if I leave the Design Factory, everything can collapse. (Founder of one of the Design Factories)

TABLE 2 Examples of change tactics related to the common challenges of the Design Factory co-creation hubs

Aim	Example of change tactic employed by staff
Securing suitable staff	One Design Factory reported having difficulties in getting the attention of the right people to recruit as instructors, so the core team used the workshops and courses given throughout the year to scout suitable candidates. Keeping a list of people that responded well during these sessions provided a quick starting point for the hiring process
Bringing external stakeholders aboard	One of the Design Factories leveraged the expertise of staff to organise hackathons, workshops and creative facilitation for local companies. In some cases, input is limited to renting out the facility, while at other times the staff will facilitate or help to plan the event. These workshops and hackathons increased short-term funding for the Design Factory, and became opportunities to form deeper relationships with the industry and get further sponsorships
Scaling change to reach more students	When one Design Factory had trouble creating their own course, they began approaching existing courses in the university. Though relatively common, courses with project work were based on either topics from research or fictional problems. The interviewed teacher then began collecting real challenges from industry for topics to be used in these existing courses

Source: Authors.

The fragility of relationships can be further compounded by the role of the co-creation platforms between higher education, industry and the public sector—in addition to the criteria of the home institution, the platforms need to be able to operate with the conflicting criteria of, for example, start-ups and multinational companies with varied pacing and ways of working (see also Table 2). ***Expectations*** can clash. For example, sponsoring companies can have difficulties in adjusting to students' iterative ways of working. This was the case in five Design Factories operating in ecosystems where university-industry collaboration was otherwise rare.

Indeed, there is an interplay between the platforms, their home institutions and external stakeholders—they all need to evolve together. Design Factories often find that they need to demonstrate results first, then lobby for resources, operating in ***relative scarcity*** even when growing. This can make long-term initiatives difficult:

> It's always fighting against the tight, because it's something different, it's something new. The board of the university doesn't understand. They only see us as a well that cost, money, and so what's the added value, they don't see it [...]. And that's a pity, that's really a pity, so we have to, I have to do a lot of talking, a lot of working with the management and the board to make sure that we exist. (Teacher at one of the Design Factories)

Funding and operating conditions can be unreliable. For example, while developing new courses, curriculum structures and content rely on a number of stakeholders and committees in the home university. Eight Design Factories reported being excluded from the official curriculum or that students did not have the space in their degree structures to take part in interdisciplinary projects (see Also Table 2). This tension between the structures of the home institution and the operations of the platforms can ***constrain students***:

> We have quite strict curricula which means that students often have only a choice of courses for three or six credits over the two years in their Master's, for example. Even if they want to take the course they simply cannot fit it within their curriculum. (Teacher at one of the Design Factories)

Stable ***physical facilities and organisational standing*** can be difficult to secure when the platforms do not fit neatly into disciplines, as a university's resource allocation mechanisms are typically built around departments. Structural changes are much slower than the pace of operations at the Design Factories, increasing the risk of mismatch in operating requirements of the platform and affordances of the home institution. Interviewees from 11 Design Factories explained that top leadership support was required to work around and in-between silos, combined with the inventive re-use of resources, which can be hard to secure:

> The values and culture inside the university, it's very, very old. So they put obstacles in our way when we want to either acquire material or we want more space, we desperately need more space, we just have a small room or ourselves, but all of this is very hard because they don't really get the point, like why do you have students having fun, why do you have a couch in your space, and it's very hard to change this kind of mindset. (Teacher at one of the Design Factories)

As a result, Design Factories are frequently only partly embedded in their home institutions and partly outside of them. They aim to lead by example, but in order to ***scale change***, change cannot remain solely within the platforms. If initiatives remain dependent of the platforms, the capacity for experimenting further is limited. Older Design Factories may find themselves tied to maintaining previous changes, with fewer resources to explore new opportunities. This can lead to an overemphasis on incremental development, which can be risky when operating partly outside existing structures. The organic structures can also lead to inertia as the community grows, as there may not be a clear leader or responsibility structure in place (Table 2):

> We need someone who is in charge of steering the boat. It's easier to go on your own and do things if there is a clear direction. But I think at the moment we are kind of, maybe lacking that direction, like where are we going and what kind of experiments should we do. (Staff member at one of the Design Factories)

5 | DISCUSSION AND POLICY IMPLICATIONS

As universities face shifting student, industry and societal needs in an increasingly competitive landscape, developing ways to innovate across disciplinary and organisational borders has become an important goal (Asheim et al., 2011; Guerrero et al., 2015; Heaton et al., 2019). Design-driven, interdisciplinary platforms have become one way of organising such learning (Kurokawa, 2013; Liedtka, 2018; Micheli et al., 2019). However, differences in operational, structural and cultural frameworks can make the relationships between innovation platforms and their various internal and external stakeholders fragile. Creating conditions where design- driven, interdisciplinary co-creation hubs can thrive and support the efforts of their stakeholders requires a systemic approach and policy framework to scaffold conditions that favour collaboration. Although limited to an intra-platform perspective, the current case study of the Design Factory co-creation platforms identified challenges linked to continuity and scaling, where novel hubs deal with the inevitable frictions that come with new partnership with well-established institutions. The functional and structural variability of the platforms, their home institutions and external stakeholders such as companies and municipalities paint a complex picture of how innovation in higher education can look today.

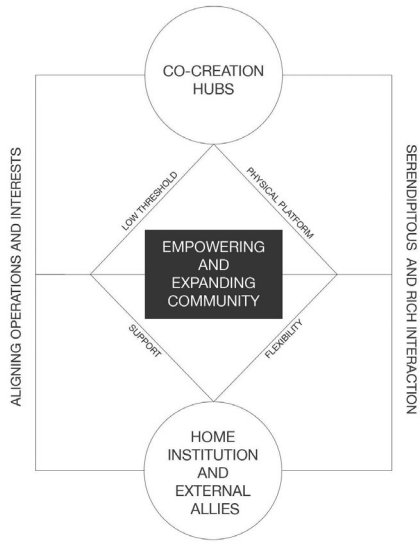

FIGURE 4 Enablers of experimenting through co-creation platforms. *Source:* Authors

The universities' fostering of strategic experimentation through funding and space provisions has been crucial for Design Factories as a core enabler and process-based method of securing further grant-based and private sector resources. Accurately planning and predicting complex interactions across different stakeholders is not feasible; rather, successful change proceeds through a series of collaborative experiments through these platforms. Six recurring themes emerge from the case study of the Design Factory Global Network that enable its change and growth strategy through design-based experimentation (Figure 4).

5.1 | Policy implication 1: Measuring and budgeting continuity to empower expanding communities

Enabling design-driven experimentation across silos is empowering and expands community through co-creation hubs. Policy regarding innovation hubs is a vital consideration to minimise the burdens for diverse stakeholders through the provision of institutional expectations and pathways for unlocking potential. A balance between institutionally-enforced responsibility and flexibility is required for creating novel and valuable dynamics within organisations.

Design-based approaches and co-creation democratise innovation processes, drawing from stakeholders' diverse knowledge and experiences. This adds complexity to measuring success, whilst enriching the collaboration ecosystem. Indirect benefits from innovation platforms are key when measuring the tangible and intangible returns from a policy perspective institutionally. Having a steady budget less reliant on traditional performance benchmarks, including smaller flexible sums for experimentation, is important in sustaining hub creativity and freedom to explore. At the national level, it is also important to balance this flexible funding with platforms' needed contributions to and engagement with the surrounding region, which can run counter to the trend of institutional specialisation or national profile (Chatterton & Goddard, 2000). This allows the platform to become a wider scale community asset.

5.2 | Policy implication 2: Offering flexibility and university-level funding to align operations

Despite being distinct entities, co-creation hubs benefit from aligning operations to other changes, interests and allies where possible. Leadership support is required to operate outside established structures of the home

institution, even in grass-roots initiatives. In the case of Design Factories, alignments were made with rising strategic foci and initiatives for home institutions and external industry collaborators, such as design thinking, entrepreneurship, professional skills or digitalisation, as well as intra-institutional rearrangements and national changes in degree, funding and campus reforms. This can lead to virtuous cycles of supportive synergy. Notably, the Aalto Design Factory would not be where it is today without Aalto University and the wider interest generated for collaborative innovation and educational reform. At the same time, Aalto University has benefited from having a concrete initiative and a space to showcase proposed changes towards more interdisciplinary and cross-organisational operations.

Beneficial connection and legitimacy to the larger institutional context becomes more likely in universities where space is given for the innovative platforms to perform iteration of small, visible and concrete "wins" (Reay, Golden-Biddle, & Germann, 2006). Freeing additional resources and support at the university level can lead to operational and structural changes beyond predefined disciplines, activities or scopes. Fostering a culture of flexibility and experimentation helps to sustain operations in the face of collaborative frictions in the long run.

5.3 | Policy implication 3: Creating physical facilities to encourage rich interaction

Co-creation platforms should be open to and value all actors to keep the threshold for joining collaboration across silos low. Two features of the Design Factory platform stand out here: the role of students and physical facilities. Though students are the largest stakeholder group in universities, some structures and practices in universities treat students as passive knowledge and benefit receivers rather than as active contributors with unique perspectives. For example, students typically have limited ownership of university facilities; yet, seemingly small details such as access to personal storage can have significant symbolic value for increasing a sense of belonging. This is crucial for encouraging participation and enriching perspective diversity.

The physical platform can be leveraged to enable informal, loosely defined collaboration by displaying new operating methods for both internal and external stakeholders and creating opportunities for serendipitous connections. In institutionally-fostered hubs with an absence of formal structure, rich interaction becomes more likely in making necessary connections for co-creation. In Design Factories, multifaceted roles and areas of expertise emerge in unpredictable ways, given functional flexibility. A student may enter as a course participant who is interested in learning design thinking, but be an expert coder who can help to create a knowledge sharing platform for a collaboration initiative—yet, finding this connection can take time and personal contact. Here, actors are non-reductive entities in co-creation platforms. Investment in the physical dimension can run counter to many current initiatives that promote the move to online learning (Henderson, Selwyn, & Aston, 2017).

Overall, the Design Factory Global Network case study illustrates how operational flexibility facilitated by university policy can lead to novel collaboration and mutual benefit; on the one hand, collaborative platforms are allowed to be process driven to empower creative solutions, and, on the other, institutions have a concrete showcase of what happens when participants are encouraged to create together towards shared goals. The juxtaposition of informal connections and methods with necessary resources and strategic policy can create a beneficial paradigm as universities adapt to new competitive realities in the public and private sectors. As societal innovation continues, so too should performance benchmarks for innovative and risk-taking enterprises in higher education. The relationship between students and educators is bidirectional when creating knowledge and innovations, and these new platforms can empower younger minds in ways that will ensure valuable contributions for the future, especially when traditional institutions are ready to take the plunge.

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