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Innovation Openness and Business Models of Shared Machine Shops in Budapest

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ABSTRACT

Shared machine shops are designed for providing space for education, learning practices, however it is also being questioned if they are accessible and for whom, depending on their location, communication practices and the entry-point in knowledge. Nonetheless the narrative of innovation and creativeness being attached to these spaces, the shades, openness or even absence of innovation is of a scholarly quest. Moreover, their function of enabling designers-entrepreneurs with infrastructure, collaborative practices and expertise is at the forefront. This paper looks at the composition of hybrid business models behind the activity of a set of shared machine shops: a fablab, a makerspace, a hackerspace, and printer-vendor company and how it may be linked to the education and innovation practices performed by the members and visitors. In search for if and how they represent dots of change on the landscape of design, this paper examines the facilities and opportunities for young designers, students, and makers to engage with digital technologies in Budapest, in a context where public schools and universities lack the access to fablabs and maker laboratories.

Keywords: Innovation openness; Fablab; Makerspace; Hackerspace; Shared machine shops, business models

OVERVIEW

Innovation openness has raised scholarly interest in economics, management, sociology, and design for different reasons. One span of attention is given to openness as means of raising design options for innovation, for strategic sourcing in and out of knowledge, capability or technology. Another view concentrates on the collaborative efforts and the potential of the innovation process driven by a prompt and global- local, *adhoc* or curated network of capabilities and motivations. In this vein, maker, hacker and DIY practices have been associated with a culture of openness, sharing, production, problem-solving, and entrepreneurship, as well as intermediary agency for linking science and society, or industry and the public through establishing and spreading technology-related practices (Gerschenfeld, 2012) for technological co-creation (Guzman and Cuellar, 2018).

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Makerspaces, fablabs have been framed as a field of innovation rendering technology closer to the public, and viewed as sites of democratization with a potential to boost entrepreneurship. Since the widespread unfolding of the movement criticism addresses the above specifically, not being democratic, inclusive and accessible for all (Touplin, 2014; Söderberg and Delfanti, 2015). Fablabs or makerspaces may be based in libraries, or universities providing free or low-fee services with educative and awareness-rising purposes, targeting a general public (Eychenne, 2012). In Italy and France the majority is grassroots, while in Germany or UK are hosted labs (Troxler, 2014). The overarching term of shared machine shops is intended to cover the diverse models of fablabs, maker- and hackerspaces, as well as co-working spaces rendering digital machinery services. These machine shops are run by different business models and sponsorship structures, while hacker and maker movements and communities express distinctive variety (Hunshinger and Schrok, 2016). Naming and framing of these facilities varies, Menichinelli (2016b) argues that makerspace covers only a part of the global community, Menichinelli and Ranellucci (2015) draw the attention to labs being out of the "shared machine shops" term for their limitation of machines, and self-identifying rather as community places in the example of Italy. Along with the bottom-up and bottom-down created shared machine shops aiming at establishing the institutional openness and availability of technology, communities are being pulled to fill these spaces. Makers and hackers are known to organize themselves, but in other contexts machine shops purposefully build and educate these communities, promoting series of events and workshops. Collective DIY activities in making places bring together members for developing skills based on shared resources (Hecktor, 2018).

The innovation hub view that would contribute to an economy's revival at large through inclusion and education, can be traced back to the original idea and model coming from the MIT in the 2000s establishing labs for bringing technology to peripheral communities (Gerschenfeld, 2012). Later these were taken off campus in the USA, and independent Fablabs opened their doors for communities of makers. Fablabs are required to follow a set of regulations of the Fab Foundation (fablab.io). Operating with a commercial-oriented business model Techshop was founded in 2006 in Silicon Valley as a membership-based for-profit makerspace, and techshops belonging to an enterprise-owned network. In Detroit Ford signed up for opening a techshop on the Ford-owned property, for employees as members working on inventions under the Employee Patent Incentive Award program (Deloitte, 2013). Techshops provided subscription-based workshops, where the users were members (Smith, 2017). It announced bankrupt and was sold by the end of 2017, claiming that it could not access grants serving the maker movement's non-profit nature. Co-working

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spaces may also provide prototyping facilities. Makerspaces are member-based but non-profit, with open days and engaging with community orientation. Makerspaces is an umbrella-term for all community-based shared-machine workshops for digital fabrication. The view of makerspaces that are accessible for people for participation, community and reflection towards technology-based practices is in close connection with the optimistic view of the science, technology, society strand, and stems from the view of makerspaces as real sites of community (e.g. Anderson, 2012). Moreover, it also suggests that makerspaces would lower the barriers of entry for socially innovative activity (Smith, 2017: 2).

Shared machine shops are envisioned to push maker communities toward global networks and fostering a new industrial revolution (Troxler, 2014; Anderson, 2012). I rely on the term shared machine shops for describing the spaces that are digital technology-driven, and center their activity around collaborative design, education or community. Machine shops focusing on DIY in other areas like sewing, furniture-building, bicycle-repairing, gardening etc. are not discussed here. Maker identity is suggested to be developed from the collapse of user and producer identity (Gauntlett, 2011; Dias and Smith, 2018), or makers, designers are identified as entrepreneurs (Arquilla et al. 2011; Bianchini and Maffei, 2012). Hackers and makers may represent a lifestyle identity focused on self-expression as making (Davies, 2017). Users of fablabs are also practicing entrepreneurial designers, or practicing the role of Designer = Enterprise (Bianchini and Maffei, 2012 citing: Arquilla, Bianchini, and Maffei, 2011), that gradually may develop into startups, backed by the community of the fablab for sourcing in knowledge. This paper considering the target of the shared machine shops relies on an audience of visitors, that can be either walk-in or community-members.

Additive manufacturing and related fields (as laser-cutting etc, for small-scale manufacturing) represent only one area of enabling technology of the industry 4.0, and may stand somewhere in between the angles of day-to-day living and factory in the field of manufacturing and tangible problems (Celaschi, 2017: 98-100). Ranging from IOT, big data, cloud manufacturing, AR, and collaborative robotics challenges are overturning enterprises that may enter as beneficiaries resulting in an increased need of adaptation of design practices, calling for overcoming 'cultural limits' of engaging with multiple disciplines and a need for knowledge mediation. We know that the limitation of absorptive capacity of a given firm is a barrier for outside knowledge and capabilities for innovation (Cohen and Levinthal, 1990). Despite that shared machine shops, like fablabs and makerspaces are narrated to be sites of technological playground and spaces for learning they can provide with a limited set of knowledge and skills, at least in Budapest today. Even though along predefined projects,

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the experience of fabricating, raises the basic understanding of some of the technologies of firm members participating in workshop-events.

From an urban dynamic perspective Dias and Smith (2018: 52) point that the dozen machine shops of a city like São Paulo are 'spaces for creative expression' or sites of education, the first visited mainly by artists, engineers, architects and college students, the later, embracing teenagers and children. These spaces do not emerge from communities, but rather communities are being created in the seeding period, backed by events for sharing experience to activate groups. From an activity perspective Capdevila (2013) differentiated the labs by projects run by fablabs, co-working spaces, makerspaces, hackerspaces and living labs, as institution- or user-led, forprofit and nonprofit projects focusing on either economic or social development. This typology is challenged by a business model approach placing educational needs, financial sustainability, and/ or the economic rewards of socially responsible endeavours in the heart of analysis. Binding the predominantly emerging topic of commons-based production and viable business models to support them, Troxler and Wolf (2010) suggest a rough model along open and closed and lab as facility and lab as innovation lab approaches typifying four essential types. However due to information hiding and the multiple diverse activities of a lab, these dimensions can take on a further shaded form. Osterwilder and Pigneur (2010) reduced the scale to three core business types: focusing on product innovation, customer relationship or infrastructure management, before unbundling and developing into different models. The types suggested by Troxler and Wolf (2010) lay within the logic of the core types of infrastructure management (facility lab) and customer relationship (innovation lab). Following the 4-dimensional setup of the Fab Lab Iceland Report [that cannot be retrieved anymore, and is cited by Menichinelli (2011)]: the models that I found are hybrid versions (see Table 1.) of the (2) Education business model: which is a global distributed model of education through FabLabs, with P2P learning among users, and (4) the Replicated/ Network business model: that provides a product, service or curriculum, utilizing the infrastructure, staff and expertise of a local Fab Lab. This model can be replicated, sold and implemented at local labs with sustainable revenue. The (1) enabler model: provides maintenance and services for existing labs, and launches new labs, and the (3) incubator model: provides infrastructure for entrepreneurs to transform fablab creations into businesses, by backing with infrastructure, promotion and marketing, seed capital, and the network of the fab lab. The business model approach to understanding how these spaces work, can be further challenged by questioning the innovation ecology around them, and innovators as a customer segment of fablabs (Troxler and Wolf, 2010).

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1. AIM, SCOPE AND METHOD

There is a gap in questioning the assumed innovation ecology around fablabs and makerspaces. The objective of this paper is to typify the business models of four digital technology-driven shared machine shops with reference to their activity and performed innovation practices. The stress falls on the open/ collaborative innovation practices and the mixture of knowledge productization. Therefore, the scope of this paper is focusing on this particular mode of business modeling, with no whatsoever account on other players and their arrangements. For this purpose, the four players that can be found in the field were studied: a fablab, a makerspace, a printer-vendor company, and a hackerspace, in Budapest, Hungary. The contextual account of these spaces is particular, as in the time of the emergence of the studied spaces, no policy-level, or local governmental structures were fostering the establishment of centers for the purpose of enhancing digital literacy, supporting innovation in decentralized digital fabrication labs, neither in the higher education sector. Instead, behind the emergence of the four spaces we can find tiny communities of tinkerers, digital fabricators, or entrepreneurs. Presently, makerspaces are being brought to the schools across the country, and disperse communities of hackers, as for e.g. in Szeged, which was inspired, and connected to the hackerspace in Budapest, or a one-man-run tiny lab within the premises of the Dunaújváros University can be found.

This research is employing a qualitative tradition of grounded theory (Strauss and Corbin, 1998), based on the triangulation of data collected with digital ethnography. Ethnography is being applied to the digital world implying online observations and data analysis as netnography (Kozinets 2002), as well as it constitutes an emergent field of digital ethnography where participative observation allows for describing and interpreting events related to digital practices, in this case innovation practices of the participants, and the availability, skills, and on-site facilitating activity of the organizers (Pink et al. 2015). This research follows this path with fieldwork based on participant observation and semi-structured interviews on-site with practitioners and fablab, and makerspace shop managers. Some interviews have been run several times in a two-years' time-laps (FabLab and Makerspace), some were recorded and some were not. Fieldnotes were taken during open days and nights, and workshops/ hackathons backed with participative observation. I add insights from three hackathons, where on-site interviews and participant observation tackled the motivation of participants and visitors. Moreover, I rely on the thesis data of interviews with makers, managers and young entrepreneurs I supervised (Abai, 2018).

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2. INNOVATION OPENNESS AND PEER PRODUCTION

Innovation openness relates to the process of innovation, either to the permeability of the firm sourcing-in and out for ideas, and selling innovations as spillovers, which is the producer-driven model followed since Chesbrough (2004), or openness in the sense of collaborative forms of design and production: such as peer-to-peer, open design. The user-driven approach is the frame followed since Von Hippel (1976, 1988, 2005). The fourth dimension of openness is innovating over networks (Faludi 2014), that is diffuse, distributed, decentralized networks of design (Menichinelli, 2016a): where networks can be loose, local, lacking coordination or constituting shared systems by different agents. Producers and users have been seen as constructed roles, where boundaries are crossed swiftly. There is an overlap in how open collaborative innovation and peer production is being framed. Peer production has been not less discussed, taking Benkler's (2009: 2016) definition it assumes a self-selection of the participants in organizing themselves in modular form, with a large pool of expertise, a non-monetary drive, and open commons of input and output. At this point there is no difference with what we know as open collaborative innovation suggested by Baldwin and VonHippel (2011). Benkler himself relies on open innovation over networks, thus the producer-driven model following from Chesbrough (2004) as in his words open collaborative innovation "is a set of productive practices that have developed among firms in various complex product and innovation-rich markets for a while, although they have gotten a boost 4 from networked communications" (Benkler 2009 (2016): p. 4). While, open innovation is about the firm being permeable for sourcing-in and out of innovation, over networks (Chesbrough, and Vanhaverbeke 2006). Baldwin and Von Hippel separates clearly the open innovation paradigm of producer-driven practices, where the outcome is commercialized on, from open collaborative innovation with contributing users, participants benefiting from the design itself, and participants obtaining private benefits of learning, reputation, fun, etc. Herewith I rely on open collaborative innovation as defined by VonHippel and Baldwin (2011), which is in line with what Benkler calls commons-based or original peer production, and separate it what he calls firm-hosted peer-production, thus where the firm depends on its users, and the firm provides the platform, infrastructure etc. for a producer-driven peer-production model innovation. This paper adds the dimension of openness of innovation practices for shading the business models adapted.

3. DISCUSSION

In Budapest, neither public universities, nor schools operate fablabs or makerspaces with active communities. The examined shops in Budapest follow predominantly a business model based on mixture of education and infrastructure for students, and show less activity

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for other potential users (public, companies, and for e.g. academia researchers). The main activity is centred around providing their infrastructure for team-based or membership-based use. Innovation as an industry-focused activity is not prevalent, and these shops perform limited activity, rather as supplier (FabLab) for well-defined tasks. The examined shared machine shops are ran by their own employees, and supported by volunteers.

The *FabLab Budapest* founded in 2011, is part of the international Fablab network (fablab.io), with ongoing projects and international partnerships. Located in the city center, it is engaged with providing facility, services as design, and workshops. A substantial pool of customers are specialists not familiar with digital technologies, and designers with some knowledge. Services range from printing, consulting, developing to fine-tuning complete design and prototyping of solutions for enterprises. The services-rendering makes it a competitor with other providers involved in 3D-printing technologies, like the FreeDee Printing Solutions (the 3D-printing vendor) in Budapest. The business model thus relies on the income from printing and 3D-design services for the industries both inland and abroad, as its main income-source: in a supplier-role of solutions, that would impose extra transaction costs for the enterprises to develop in-house. Furthermore, the Fablab is a hub providing a collaborative space for sharing knowledge and expertise for a loose community of young maker-entrepreneurs working on their brands, like the wearables designer who develops her own brand in co-creation with the FabLab's technical support and marketing advice. The value proposition of this activity branch of the FabLab is thus membership-based community initiatives, or community-based support for innovative solutions to get to the market. The membership-fee is an entry-point to the community. A further substantial set of activities of the FabLab is themed by higher education providing services for designer, engineering and technology students with low-fee entry, within a cooperation framework with MOME the Moholy-Nagy University for Design, which does not obtain any facilities, however graduates are expected to know the technologies. The FabLab Budapest is a hybrid form of the education and the incubator business models, backed by the income-generating customer-relationship model. Table 1. summarizes the hybrid business models adapted by the players, leaving more space for the business model most prevalent for each shop, based on estimation and not precise calculations for highlighting the hybrid variations.

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<table>
<tr><th colspan="4">FabLab Business model</th></tr>
<tr><td colspan="2">Customer-relationship model
(services, prototyping, printing)</td><td>Education model
(P2P, HEIs)</td><td>Incubator model
Designer=entrepreneur</td></tr>
<tr><td colspan="2">Supplier of solutions for in-house use</td><td>In-house closed innovation</td><td>Collaborative innovation practices (peer production)</td></tr>
<tr><th colspan="4">Makerspace Business model</th></tr>
<tr><td>Customer relationship
(services)</td><td colspan="2">Replicated/Network business
Curricula, trainings</td><td>Education model
P2P</td></tr>
<tr><td></td><td colspan="2">In-house closed innovation,
IP protection by modular information hiding</td><td>Collaborative innovation practices events</td></tr>
<tr><th colspan="4">3D Printer-vendor Business model</th></tr>
<tr><td>Infrastructure management
Machine-vendor</td><td>Customer relationship model
(services: prototyping, printing, design)</td><td colspan="2">Network business/ enabler model: not in a local fablab, but rather supplying schools with infrastructure and
curricula</td></tr>
<tr><td></td><td>In-house closed innovation,
IP-protected</td><td colspan="2">Closed innovation,
IP-protected</td></tr>
<tr><th colspan="4">Hackerspace</th></tr>
<tr><td>Grants and membership reliant model</td><td>Incubator model</td><td colspan="2">Open for the community</td></tr>
<tr><td></td><td>Open collaborative innovation</td><td colspan="2">Open source knowledge share</td></tr>
</table>

Figure 1. The composition of the hybrid business models and innovation practices of shared machine shops

The 3D-printer vendor is a profit-seeking company trading with industrial and desktop printers in Hungary. Its Academy provides a range of short trainings in the basics of 3D-scanning, printing and modelling (prices range around 50-150 Euros) for users, and customized trainings for companies for smoothing their shift to additive technologies. The education program is targeting schools, with the sponsorship of companies. The explicit aim of is to get a specific product, the widely popular Makerbot to the users. In 2015, 11 schools have won the Makerbot, since this number has risen, as well as the variety of available desktop technologies. High schools and elementary schools are applying to these programs.

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Schools applying to government-funded digital lab programs can freely download and join the strategy and application-proposal elaborated by the vendor company and its partners. The vendor company is a real competitor to the Makerspace in its focus on education and schooling. The business model of FreeDee Printing is centered around selling machines, and printing-design services for the industry.

The *Makerspace's* main activity is centered around education providing courses, workshops and summer camps designed overwhelmingly for kids and teenagers and as a broadening focus for adults, with specifically targeted and designed ready-made trainings. The revenue stream is fed predominantly by the training courses, and some grants. Training packages range from longer courses to short DIY workshops as an in-house developed know-how. Educational school packages represent a special market targeted by different players, those who are interested in engaging and training the future consumers of their products, and those whose key revenue is education and training. Educational toolkits and curricula with gamification represent a unique product of the Makerspace. The descriptions and books, even if revealed, cannot be applied directly, as being part of a system of methodology used. Modular conceptual design thus allows for hidden information on the developed product as a way of intellectual property rights protection. The Makerspace's value proposition is centered around the customers', thus the parents' needs of an entertaining form of education in a relaxed, focused and gamified form. These programs are designed to be appealing for the parents, who are targeted at first place. They are looking for "creative, free, and tolerant programs that are affordable". Working with machines and projects require discipline, which creates tension at times. Educators are reportedly challenged by combining discipline with attention-grabbing activities for kids older than 11. The Makerspace creates workshops for adults, as dress-printing, and recently a biolab. Enterprises are recently targeted by teambuilding tool for making and DIY workshops. The Makerspace is focusing on the international market, with its gamification training methods, and a new approach on the accessibility-focused Mission Empathy project. The overall aim is to provide educational tools adaptable to diverse settings on a global scale, as well as to bring the know-how and machine shops to every school in Hungary, establishing a network. An offspring initiative of the Makerspace is the Edu&Fun Digital (Élményközpont) that has moved to the same building from September 2018.

The *Hackerspace* called HACK (Hungarian Autonomous Centre for Knowledge) is based on a closed network of hackers, it is an authentic hub for tinkering at the heart of the city (however not that easy to find as Mestler explained in 2017), in a basement. This place

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belongs to the international network of hackerspaces and was established in 2009. Members of the community perform their identities of hackers with a strong emphasis on open source, on experimentation, and hacking for play and problem-solving. There is a membership fee (around 20-30 Euros/month), however anybody can join the workshops centered around debugging, repairing, or deconstructing for understanding tools (TV), or software. The events take the classical formats as jam, hackathon (taking place at night) config, privacy or open night. In the summer, there are a 3-day camps with presentations and workshops (all content published on youtube). The Hackerspace organizes open nights in every fortnight that are open to the general public. During the open nights, some were looking for a space for their endeavour, others would have specific questions on debugging problems. The programs are not targeting a wide public, and are not designed to provide with an entertaining toolkit for executing a predefined project, rather constitute an opportunity to learn for those who already belong to the local or the global network. These events suggest a basic knowledge, and shared traits in performativity of debugging, developing or hacking code, repairing and deconstructing, linking the analogue and the digital. Revenues are fed by grants, and membership fees, key resources stem from voluntary work, and community contributions. The value proposition of the Hackerspace is experimentation, peer2peer collaborative work, gamified problem-solution jams.

The more a space is engaged with open-source, the less it is reliant on service-provision or hardware-vending. Collaborative innovation practices are taking a form of emergent ad hoc project-based organization in the case of the Fablab community where entrepreneurs or makers can learn about their ideas, enterprises if they need to move forward. Peer-to-peer work or collaboration is not suggesting purposefully innovation.

3.1. Innovation practices and communities

While enterprises are focusing on the consulting services of these shared machine shops (in line with Menichinelli *et. al.* 2017), what makes these shops different from other business model schemes is the profit-constraint. Employees are paid wages, and express personal benefits of contributing to the work of the organization, as working for passion, stressing their dedication that imposes surplus working hours, beside other educational, teaching, or design-services they perform for other organizations. Visitors represent several main groups: 1) the clients of services, 2) consumers of the paid workshops, 3) participants of free and voluntary events, and 4) membership-holders: participants or facilitators of projects, sharing the knowledge with others using the space. The interviewee at Fablab organizes workshops since his first meeting with a 3D-printer, and believes, that the "*segregation of*

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those who can or cannot pay for the knowledge-intensive good shall be stopped by knowledge-transfer. There are those in-between, who get the knowledge from the grey-zone of knowledge distribution" (Abai, 2018. p. 45).

Innovation practices can be divided along two major sources, where 1) 'walk in' designer or client brings the solution for printing, assembly, etc., that may be either adjusted, or redesigned as a service 2) emerging collaborative structures for developing ideas. Consulting a project that can be worked upon is part of the profile, however according to the manager of FabLab rules of thumb for entry are being developed, thus the minimum requirements of knowledge and vision of a project that can be advised upon. To his view 9 out of 10 participants do not possess a clear idea (Abai, 2018). The same is valid in the case of large producers entering the Fablab for printing services, that are claimed not to be familiar with the possibilities of digital technologies, thus their solutions need considerable adjustments (Abai, 2018, p. 59). Furthermore, the infrastructure is not fully adjusted to all prototyping:

> "They bring plans that would be easily implementable with larger machines (50-100 Million forints), but not here. Young designers, who are not familiar with the technology, does not know about it. We need to go into long discussions to make them understand our offer (or other materials or technology) are tailor-shaped, but he does not seem to want, as he believes in his own information on what works out". (FabLab Budapest (Abai, 2018)).

The co-founder of the fablab develops and shares game toys files open source, however he also claims that there is not much time to develop own projects, due to the workload (Abai 2018:54). In the case of the Hackerspace workshops, camps with tighter program-descriptions and elaborated educational packages are aiming at teaching-learning the tools and methods. The communication of these programmes is centered around the joy of experimentation. Hackerspace's nights for debugging, repairing, and tinkering are about the challenge of problem-solution and experimentation. The Makerspace is a "a hustling crowd of people, just like the Coruscant in a Star Wars film" (member of Makerspace) (Abai, 2018: 46).

Communities share the experience of ideation and experimenting, however it is less obvious that it would turn into a commercializable product, the experience is rather about making and fabricating along the idea than innovation itself. There is no large-scale production, or production based on community-centered innovation, rather designer-entrepreneurial brands emerging, or teams forming toward a startup, that need to enter an incubation program and go through the start-up phases. Communities are flat and rely on voluntary

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participation (Magee and Galinsky, 2008) building around social structures emerging from repetitive interaction of participants.

As discussed before openness can mean the relationship to the output of the innovation activity: if being commercialized or rendered as a public good. Hybrid goods are challenging the product as a modular system of combined tangible and nontangible products. Makerspace for e.g. offers education programs and develops education tools, that follow the logic of consultant-training service-provision. Rendered in the open space of usage, still it cannot be applied without the knowhow performed during the trainings. The business model of the Makerspace is based on a not-for-profit constraint. For balancing the budget the revenue stream is based on trainings, design and prototyping services for companies, as well as selling the know-how of how to build a makerspace workshop in the premises of companies (or schools, or homes).

It can be claimed that one important mission is to fill in the gap in primary education, and establish fablabs and education tools within the schooling system in Hungary, where most important players are the Makerspace and the 3D-printer vendor company. Higher education students do not have access at their universities to fablabs, thus the FabLab is in cooperation with the university producing designers (MOME). However further important players are the University of Technology, and the Semmelweis University (Health, Medicine, Pharmacy) in Budapest, not speaking about the other universities in the country. For these students workshops represent an entry to current technologies, (bio)lab experiments and tinkering, an experience they miss from their studies and lab-work in formal university conditions. Tired of her lab experiments with longer-term and more abstract results, a medicine student arrived for this only day to Budapest as she “wanted to create something that is useful”. A student in engineering expressed that the old techniques in the university labs lack of project-based learning and practical knowledge. These needs of “looking for such opportunities but can’t find a community” could be addressed by the existing shared-machine shops with a larger pool of cooperation and focus on a wider net of universities. A further solution would be creating machine shops closer to the university premises, with a sharper focus on community-building around making, and fabricating. Students also commented on the lack of being able to work in real collaborative structures, as a motivation to come by. Events targeting students are opening the path for further community-involvement into the workshop activities.

That said building communities is an important mission but not at the forefront of the activities of these machine shops. In this line the communication channels are network

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based, ad none of the shops are promoting larger scale PR-activities, or targeting wider audiences. Providing infrastructure, space for establishing collaborative networks, and expertise they foster entrepreneurial endeavours of users, and designers, serving as innovation hubs. Designer as self-producer stem from experimentation with materials, solutions and technology, opening the path for converting thyself into an entrepreneur. The Hackerspace differs by its closed, organic, local and grass-root community, nested into the glocal scene, acting for openness. All of them are operating within a profit-constraint and are focused on knowledge-sharing.

4. CONCLUSIONS

The potential stemming from collaborative innovation is more of use for individual designers, or organizations focusing on community-driven solutions. Outsider organizations bring in projects that are environmentally or citizens-focused. The makerspace or fablab provide infrastructure and expertise of the designer-mediator that has grown to designer-contributor (Faludi, 2014), that would tap into the knowledge of communities putting their capabilities mediating between needs and solutions.

What came clear from this study, is that these spaces fill in a void in the urban scene of Budapest, and broader than that, needs stemming from Higher Education across the country, or disperse communities of tinkerers, designers or digital fabricators. The presented digital shared machine shops do not benefit from the open innovation model attached, in the sense of sourcing-in knowledge and innovation to larger firms from the fabricating communities of designers, entrepreneurs, or students. In this sense there is no incubation. Open collaborative forms of innovation, however are present as a substantial part of their activities (except for the 3D-printer company), specifically in the case of the hackerspace that genuinely embraces open collaboration, and experimentation around projects, or solving well-defined hacking goals. In the case of the fablab the open nature of the lab conditions provided show traces of semi-accelerating-advising activities that are being present (however implicitly). The makerspace is open for events and activities coming from outside, for e.g. for hackathons that are addressing some innovation-outcome in the form of prototype. Activities around fabrication are rather focusing on sharing skills and knowledge, and serving for activities for the joy of fabrication.

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