FABLABIA

FabLab as an entrepreneurship-supporting tool for business innovation centres

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Executive summary

This design option paper (DOP) summarizes the main outputs and recommendations based on the experience of three business innovation centres who use FabLab as an innovation tool for the benefit of SMEs: JIC from the Czech Republic, Technoport from Luxembourg, and brigk from Germany. Each agency and FabLab represents characteristics for their region or country, and their experience demonstrates a variety of mechanisms that should be taken into consideration when designing such a service or program.

The overall idea of the consortium started with the realization that it is rare for Europea business innovation centres to operate a FabLab and that this tool is currently under-exploited as a business innovation support service for SMEs in general.

The purpose of this document is to help with **uptake of FabLab/makerspace services for SMEs by any interested innovation support agency in Europe. Vice versa, this paper also aims to underline the benefits of cooperating with business innovation centres to other FabLabs or Makerspaces in Europe.**

The organisations involved in this project believe that the connection of a FabLab and an innovation agency is beneficial for both makers and entrepreneurs. A maker can become an entrepreneur, an entrepreneur can become a maker, or they can just find each other in the connected community and cooperate. Our aim is to contribute via this DOP to the effort of FabLabs to support SMEs in rapid prototyping and fostering entrepreneurship to create a new generation of new startups.

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Introduction

A FabLab (fabrication laboratory) is a technical prototyping platform for innovation and invention that stimulates entrepreneurship at local and regional levels. It is also a platform for where makers learn, meet, share know-how, prototype, and cooperate. The number of FabLabs in Europe has increased greatly in the last decade. According to the "Technical report: Overview of Maker Movement in European Union" published by Joint Research Centre, there were 397 FabLabs in EU28[1] (data from 2016), and our own desk research of data available in 2020 at www.FabLabs.io revealed there are currently 725 FabLabs and Makerspaces in EU member states, with 1750 operating in 100 countries around the world.

Increased access to digital fabrication tools and technologies not only increases skills of interested makers, but also **substantially lowers the entry barrier for new businesses that produce tangible products**. Personal fabrication technologies allow for rapid prototyping of tangible objects with a high level of quality, making the design of new, highly customizable products risk-free and low-cost. Moreover, these spaces are often used as **innovation hubs** by engineers, architects, and designers.[2] Several research papers and studies[3] conclude that makerspaces contribute to the **creation of new enterprises, nurture an innovation-friendly environment, and make prototyping more available and affordable.**

Nowadays, FabLabs are increasingly being adopted by schools, universities and museums as platforms for project-based, hands-on STEM education. Surprisingly, the potential benefits of FabLabs for startups and early stage SMEs have not been recognised by business innovation centres in Europe, as evidenced by our survey of FabLabs. When putting this project together, we did a desk study among 100 members of the European FabLab association, which revealed that in Europe in 2019 there were only two other business innovation centres using FabLabs to support SMEs. This partly reflects the novelty of FabLabs themselves, **but also clearly indicates that the concept of FabLabs has not yet been fully exploited by the business innovation centre community throughout the EU.**

In order to raise the level of innovation support provided to SMEs across the EU, **the main aim of the implemented project FABLABIA — FabLab as an entrepreneurship supporting tool for business innovation centres is to gather the experience of business innovation centres who use FabLab as an innovation tool for the benefit of SMEs and to turn it into a codified best practice manual (DOP).**

1 Rosa, P. et al., Overview of the Maker Movement in the European Union, p. 14. Publications Office of the European Union, Luxembourg, 2017

2 Rosa, P. et al., Overview of the Maker Movement in the European Union, p. 9. Publications Office of the European Union, Luxembourg, 2017

3 Holm, J Van: Makerspaces and Contributions to Entrepreneurship. Available from: https://www.researchgate.net/publication/282556776_Makerspaces_and_Contributions_to_Entrepreneurship

Makerspace or FabLab?

There are several names for collaborative workspaces — most commonly **Makerspace, FabLab,** or **Hackerspace.**

Hackerspace is the oldest concept, starting in 1995 in Berlin where a group of programmers started to meet and "hack" things (make them useful in a different way than originally intended). Hackerspaces are now open to more disciplines and makers of all kinds, though the programming spirit still exists there. Nowadays, the price of maker tools such as 3D printers, desktop laser cutters, and CNC routers became more affordable, thus allowing Hackerspaces to naturally evolve into makerspaces.[4]

The term **makerspace** started to be used in 2005. There is no official definition, makerspace can be a collection of tools that people from a neighbourhood gathered or an assembly of machines worth hundreds of thousands of euros. In many aspects (equipment, open community of makers), Makerspaces are like **FabLabs**, which have a similar base set of digital fabrication machines, are open to the public and stick to the same set of rules. FabLab has codified these rules into a so-called charter.

Basically, the only **difference between a FabLab and a Makerspace** is that all FabLabs must have at least one 3D printer, laser cutter, vinyl cutter, electronics, and CNC router. FabLabs are also obliged to be actively involved in the worldwide community — e.g. attend Maker Fairs, take part in an annual gathering known as the FABx conference, and cooperate on projects with other FabLabs. All in all, FabLabs have the strongest spirit of networking in their DNA.

All members of FABLABIA run either a FabLab or a Makerspace and see no reason to make a strong distinction between the two. Both spaces follow the same basic set of rules and are active in the worldwide network. For simplicity's sake in this DOP, these spaces are referred to as FabLabs.

4 https://www.makerspaces.com/what-is-a-makerspace/

Objectives of the project and intended benefits for innovation centres

The overall idea of the consortium started with the realization that it is rare for Europea business innovation centres to operate a FabLab and that this tool is currently under-exploited as a business innovation support service for SMEs in general.

The organisations involved in this project believe that the connection of a FabLab and a business innovation centre is beneficial for both makers and entrepreneurs. A maker can become an entrepreneur, an entrepreneur can become a maker, or they can just find each other in the connected community and cooperate. Our aim is to contribute via this DOP to the effort of FabLabs to support SMEs in rapid prototyping and fostering entrepreneurship to create a new generation of new startups.

What are the main benefits of cooperation between a business innovation centre and a FabLab?

One of the main motivations **for business innovation centres** to run a FabLab is to **get closer to schools and universities to promote entrepreneurship among students** with the aim to increase their digital and manufacturing skills.

For SMEs benefiting from services at the innovation centre, a **FabLab is introduced as another service specifically dedicated to rapid prototyping and a source of support for hardware as well as software companies.** FabLab also serves the business innovation centre as a very attractive place to **showcase its innovation activities** to visitors. Incubated companies also benefit from being introduced to skilled members of the FabLab community that they can either partner with or hire directly.

Above all, the most important benefit for business innovation centres is that the vast majority of FabLab users state that they would never have come to the business innovation centre, so **FabLab is an excellent way to advertise the centre and attract potential new clients and entrepreneurs to it.**

Vice versa — how does a FabLab benefit from working with an innovation centre?

This cooperation makes it much **easier to reach new potential members** in companies or institutions. FabLabs also appreciate help with **networking and cultivating a strong member community.** The crucial part lies in **helping market the FabLab**, as well as with administration processes (in terms of help with legal issues, funding, etc.).

Based on the motivations listed described above, this document was designed to address the following components:

- Mapping of good practices and success stories of FabLabs and businnes innovation centres supporting SMEs throughout Europe;
- Survey of SMEs in business innovation centres involved in the project and survey within the European FabLab network;
- Creating a manual of how to operate FabLab covering especially terms of services for users, safety issues and legal framework, automatization of processes in FabLab.

Introduction of the consortium members

Recommendations summarized in this DOP reflect experience of the following business innovation centres with FabLab services.

FabLab Brno

FabLab Brno is the first FabLab in the Czech Republic, established in 2017. It is a so-called full size FabLab and its 182 square meters are full of machines — a large CNC router, a laser cutter, 11 3D printers, a vinyl plotter, an embroidery machine, electronics, and mechanical lab.

After 3 years in operation, FabLab Brno has around 270 active members, and FabLab Experience — a mobile FabLab laboratory — serves more than 10 000 people a year in more than 60 schools. FabLab Brno is partially funded by the city of Brno, the South Moravian Region, and partners such as private companies, corporations, and universities.

JIC

Connection with a business innovation centre: FabLab Brno is part of JIC. JIC is a leading business innovation centre in the Czech Republic providing support services to innovative companies in the South Moravian Region. Their mission is to empower people to grow businesses that can change the world. Their vision is an open innovation ecosystem which is home to globally successful entrepreneurs, and which inspires the world. JIC runs a comprehensive set of programmes that cover the full spectrum of an entrepreneurial life cycle — from the first idea to a startups with a validated business model to a growing business scaling to global markets.

Though FabLab Brno and JIC are distinct brands, FabLab managers and operators are employees of JIC.

Motivation for the business innovation centre to operate a FabLab: FabLab Brno already has several projects to its name that later turned into startups. However, the percentage of market-related projects and ideas of members is lower than 10%, so it was essential to develop a methodology which would attract more entrepreneurs to prototyping.

Technoport FabLab

In 2013, the first **FabLab of Luxembourg** (Belval) was launched by **Technoport** — a business incubator & co-working space fused with an open prototyping platform where knowledge sharing is essential. Tools such as 3D printers, CNC milling machines, laser cutters, an industrial robot, a vacuum press, and a vinyl cutter, as well as technical and logistical assistance are available to facilitate invention, open innovation, and co-creation. As previewed in the initial project in 2012, this activity opened an extension (XL) at 1535° Creative Hub in Differdange in 2017, offering further prototyping and digital fabrication facilities to a larger community of stakeholders while remaining the property of Technoport. Since its creation, FabLab Luxembourg has been working for numerous technological and creative businesses. It has been involved not only in European and international networks of FabLabs but also in Technoport's own innovation networks.

Connection with a business innovation centre: the FabLab was created as a department of Technoport, as part of the same legal organisation as the business incubator and through Technoport's own funding. The scope was to enlarge the services offered by the business incubator in terms of innovation, entrepreneurship, and business development.

Motivation for the business innovation centre to operate a FabLab: FabLab Luxembourg was set up to foster a multidisciplinary and intergenerational dynamic between startups, corporations, artists, designers, architects, engineers, hobbyists, researchers, students, and makers. It was considered a valuable prototyping and digital fabrication partner to involve in the activities of Technoport and its supported startups as a way to offer distinct and value-added technical development services to the local ecosystem of entrepreneurs and potential entrepreneurs, encouraging cross-sectoral collaborations of all kinds. The FabLab was set up in 2012 at Technoport's technology-oriented incubator in Belval and was extended in 2016 following heavy popular demand. It was then relocated to the new premises of 1535°C, a creative innovation hub where increased space allowed for a new fleet of machines to be integrated. Recently, there have been several initiatives in the field of education in Luxembourg under the „Digital4Education" project and the creation of innovative spaces in various high schools across the country. That was an opportunity for the FabLab to offer further services and have access to new skills, working with students and teachers in the field of IoT, gaming, and other digital technologies. It was also an opportunity for Technoport to set up and run new entrepreneurial activities towards an educational audience and related 3rd parties. As a result, the FabLab was once again relocated to the Lycée des Arts et Métiers (LAM) in Luxembourg City, where some EdTech entrepreneurs from Technoport can also be hosted in the framework of a partnership agreement between Technoport and the LAM.

Brigk

The brigk (Incubator for Digital Business in Ingolstadt) was established by the city of **Ingolstadt**, AUDI AG, Mediamarkt Saturn, Continental AG, HERE Technologies, and other companies and local institutions by an initiative of the state of Bavaria in 2016. Since then, the incubator has supported startups with digital business models and other high-tech products. Till the beginning of August 2018 brigk had been expanding its activity towards the field of makers and opened brigk Makerspace, a fully equipped FabLab with five 3D printers, 3 laser cutters, a plotter, a molding cutter, a lathe, different welding machines and other tools for metal and wood. In addition, it is equipped with an electronic lab, machine learning computers, and different software suites for 3D CAD, rendering, etc.

Two years after opening, there are 70 active members, almost 300 overall members, and 4 startups producing or managing their businesses from the FabLab. In the short time since brigk opened, it is encouraging to see that all startups at the incubator can and do take frequent advantage of automatic access to the facility.

Examples of the successful projects that would not be where they are now without FabLabs

OQ Technology

In 2017, Technoport launched Tomorrow Street, a new business innovation centre co-owned by Vodafone. OQ Technology was accepted into the new incubation programme in July 2018. The company received support in technology developments and business expansion in the fields of space and IoT. In early 2019, they asked the FabLab to work on a data aggregator to be used with their satellite communication systems on remote installations. Later in 2019, the requested product was successfully launched. OQ Technology is currently recruiting 5 additional senior staff members for commercialisation, with a new R&D facility in Foetz under discussion.

Webpage: http://www.oqtec.space

Paycash

In 2015, the founders of a startups came up with the idea to develop an innovative mobile payment solution. The team received support from Technoport to develop the technology, and business mentoring in the area of PR and marketing strategy, as well as access to funding. The team used FabLab to prototype and develop their first mobile scanners for proof of concept and demonstration purposes. In 2016, Paycash started commercial deployment in Luxembourg and Germany. After reaching a turnover of 1 million EUR, in 2017 they were acquired by Daimler Financial Services.

Airboxlab

An innovative company offering indoor air monitoring solutions was incubated at Technoport in 2014. The team benefited from business coaching and business development services and financed their first technical developments using Indiegogo crowdfunding. Despite a successful proof of concept, commercial development was still lacking. Drawing inspiration from the business coaching they had received, in 2015 the company decided to rebrand and fully re-engineer and redesign their B2C solution. FabLab was a crucial resource for them during this process. In 2017, the company reached a turnover of 2.5M EUR and developed partnerships with Panasonic and BlueAir.

Webpage: https://foobot.io/

Mirrads

The company Mirrads produces Smart Mirrors. The USP of their products is to provide their customers with a self-produced software to manage the ads shown on the display and a full-service package. Mirrads was founded by three students of the technical university in Ingolstadt. From the very beginning of their business, Mirrads was part of the brigk business incubator and soon rented office space within it and also made use of the coaching services regarding founding and setting up a business, as well as networking opportunities. Last but not least, it was the possibility to build the hardware in the FabLab with professional tools — without having to invest in their own — that gave Mirrads the needed boost to get their business on track and become successful. Mirrads is now the very first startup to find an investor to help them grow even more, eventually allowing them to move to a new location.

Webpage: https://mirrads.de/

3D sets

3Dsets is a fully 3D-printed remote control car. People can buy the printing data for it and build one virtually anywhere. The founder started to work on the prototype in 2018. To do it, he used the 3D printers in the FabLab and from the innovation centre he was provided with networking. Currently they have 320 customers in 40 countries.

Webpage: https://www.3dsets.com/

FabLab operation

Operation of FabLab is a crucial aspect to consider for every hosting agency that decides to run FabLab, including business incubation centres. The following chapter is divided into two sections. The first section briefly summarizes **key steps for setting up a FabLab**[5], which are complemented by experience from JIC, brigk and Technoport.

The second part of this chapter provides business incubation centres with inspiration on how to introduce FabLab as a service to its clients. The whole operations process will be described using the most common customer journey - starting with the first contact, through the membership application, empowerment of makers and community building, ending with membership termination.

1. Selling the offer
2. First contact
3. Getting information
4. Application process
5. Empowerment
6. Support
7. Network
8. Inspiration
9. Community
10. Equipment
11. Workshops
12. Membership termination

5 This process has been described many times and it is not our ambition to repeat what is already known. For more detailed information and support in this process, we recommend visiting the Fab Foundation website and referring to the FabLab Guide published by the University of Bristol.

How to set up a FabLab

Our experience shows there are many BICs, incubators and other institutions interested in operating a FabLab who have many questions and often ask existing BICs with FabLabs to share their know-how. The following section is intended to provide these interested organisations with our experience in FabLab setup and possible models of cooperation, the costs associated with operating such a facility and key components for making this cooperation a success.

When deciding how to set up cooperation with a FabLab, a business innovation centre has two options:

- Set up its own FabLab, or
- Start close cooperation with an already existing FabLab.

FabLab Brno, Czech Republic

Space: 200 m2

Initial investment in 2017: 260 000 EUR

Yearly operating costs: around 150 000 EUR

Preparation time: 1 year

For cooperation between business innovation centre and FabLab, the following **key components** are vital for success:

- **Contracts** with local partners, donors, and service providers, as well as with FabLabs in the relevant area (city, region, country).
- **A secure site** where FabLab will be operated. You have basically 3 options:
  1. **FabLab inside BIC**— If you can secure a suitable place of 200+ m2 of floor area and if you want to have the core of the FabLab connected to the SMEs, this is probably the best option.
  2. **One part of FabLab in house, and the rest outside of it** — BICs often lack a suitable space to operate FabLab at their own facility. There is, however, a smart solution even for this — you can put smaller machines on site and focus on a small production and consultations with SMEs, while operating the larger, more advanced core of the FabLab at an off-site location. The drawback to this solution are the increased costs of running two sites, rather than just one.
  3. **FabLab outside BIC**— If you choose to have a complete FabLab outside of the main BIC building, you can place it closer e.g. to the city centre to be more accessible by the general public or to the dormitories of a technical university, since SMEs are only one of several target groups that a FabLab can appeal to. One potential pain point is that SMEs will be less willing to use the facility and it will also be harder to intertwine services of the BIC with those offered to makers.

brigk Makerspace, Ingolstadt, Germany

Space: 550 m2

Initial investment: 250 000 EUR

Yearly operating costs: around 270 000 EUR

Preparation time: 8 months

- **FabLab Manager:** An essential part of every FabLab. A local community leader who believes and is passionate about FabLab and the whole Maker Movement. It is good for this person to have a technical background, but leadership and managerial skills and passion for the community are crucial.

They

- promote FabLab
- give tours and are responsible for the program and services
- raise funds, take care of cooperation with stakeholders
- develop community programs for makers and SMEs

- **FabLab Guru:** If you are operational with a busy FabLab, sooner or later you will need a technical guru. This person is usually responsible for FabLab operations. They know the machines, do the maintenance and are able to help members with projects or data. Ideal background is mechanical engineer or electronic engineer. They are in charge of

  - regular maintenance
  - buying consumables or stock materials
  - on-site safety
  - helping people with projects or with machine operation

- Secure **funding** based on local model/conditions: in some regions the most relevant sources of funding are partnerships with corporations, public/private partnerships, local funds provided from regional or national budgets, schools, universities, etc. According to the MIT sample, a full-size FabLab costs 400 000 USD for the first year of full operation.
  This cost is composed from:

  - 110 000 USD for machines and tools,
  - 290 000 USD for the rent, salaries, and other operating costs.

  All years after that are projected to cost 290 000 USD, but this number depends greatly on the machines and tools bought, as well as salaries, rent, and other services. These costs may vary greatly from country to country.

FabLab Luxembourg

Space for machines: 250 m2

Initial investment in 2012: 130 000 €

Yearly operating costs: around 200 000 €

Preparation time: 1 year

- **Purchase of the machines:** To decide which machines to buy, we recommend following the inventory list from MIT. In addition to the inventory list, it is also essential to ask target users in the given region and map out their needs — these will probably go beyond the basic set of equipment. Find out what kind of advanced and expensive machines you can set up easy access to at schools, libraries, or other locations around you. This will save you from needing to buy one for the FabLab.
- **Trainers:** FabLab staff are essential for training users and helping them use the machines. Moreover, their role is also to maintain FabLab operations and monitor the machines to prevent any damage.
- Design the services that FabLab will provide and do the marketing. Check out the Customer Journey section in this DOP to get inspiration from already established FabLabs and also the Proposed Solution section to set it up in a way that prioritizes SMEs.

Voila, now you have everything you need to launch a FabLab. Don´t forget to communicate the FabLab launch to all important stakeholders and relevant communities and invite them to participate. You don't have to wait until this later phase to get them involved, either. Their insights in the decision-making and construction process can be invaluable. It also fosters more support and engagement from them early on, which can only help you.

How to start a close cooperation with an existing FabLab

At the time of us writing this DOP, there are over 2000 FabLabs registered throughout the world. In that case, why build another one if there's already one nearby?

- Check the map of existing labs at www.fablabs.io. The vast majority of them are registered there.
- Alternatively search online for "FabLab" and the name of your city or district
- FabLabs.io is also gathering the contact details of lab managers. Get in touch with the one you like.
- Most FabLabs are not focused on SMEs, you will need to explain the benefits of doing so.
- See if you are on the same page and if you both are willing to collaborate.
- If so, design services that target SMEs (see Customers Journey and Proposed Solution sections).

Tips for promoting FabLab services to incubated companies in the innovation agency and persuading them to become active members:

- During the selection process of a new client, it is highly effective to involve a FabLab employee in the evaluation panel to provide further support in terms of prototyping. The company then knows from the very beginning how they can benefit from FabLab services.
- Bring the new companies to FabLab during meetings to showcase potential benefits. Actively present FabLab services to your companies as a service which can help them update their product.
- Provide hobby makers in FabLab with on-demand business mentoring service in case they would like to turn their hobby into a business. It will increase the chance that they will shift from maker to entrepreneur.
- PR is important — promote community, not only the infrastructure
- The presence of FabLab at Hackathons is another highly effective way to promote the impact of FabLab and its possibilities in rapid prototyping to target users
- Share success stories with your community
- Match hobby makers and incubated startups for employment opportunities (company is looking for skilled makers, and vice versa)
- Include basic membership in FabLabs as a benefit for startups incubated at the business innovation centre

Customer journey through FabLab

FabLabs have two major target groups: B2B and B2C. Both groups need different communication channels and offerings. The B2C customers are the main source of creating content for marketing and for creating a great community which all parties benefit from. With only a few B2C customers, a highly expensive place like a FabLab is unlikely to break even.

On the other side, B2B customers usually search FabLabs for experts and skilled talents, as well as to test machines they plan to involve in their production/innovation processes. An interesting offer for them could be to train their own people and prototype/test their own products. This strengthens their PR communication as a modern thinking company. Startups become more interested when they see other B2B clients already active in the FabLab, as they see the potential for interesting partnerships and mentoring/help with production.

The aim of this section is to guide all interested BICs through the customer's experience with a FabLab and to point out crucial points to handle in order to attract new clients (B2B, in particular), and retain existing ones. An understanding of this experience makes it much easier to implement the right measures to sustainably run the FabLab.

Selling the offer and first contact

The quickest and easiest way to get new customers is to introduce FabLab as a service to existing clients of the BIC to ensure every resident of an incubator is aware of the FabLab and its offer. A few things help greatly with this:

- Openlab or a free tour at the FabLab facility
- Presentation at local events — engage stakeholders
- FabLab as a prize in hackathons, competitions, and other relevant events

brigk example:

brigk introduced two levels of membership — basic and advanced. With both levels, you can work in all areas: electronics, woodworking, metal, rapid prototyping, etc. but with the basic membership the machines are easier to use, sometimes cheaper, sometimes handwork is needed. In the advanced membership the laser cutter, 3D printer etc. are bigger, more difficult to use or you even need safety training for machines like the CNC lathe. This approach allows price-sensitive people to start with a basic membership and then upgrade if needed.

Communication via social networks (Facebook, Instagram, LinkedIN) as well as a regularly updated webpage are crucial and serve not only as information points but also as sources of inspiration for makers and a tool for attracting potential sponsors. Keep in mind — whatever channel is used, any questions asked there should need to receive a prompt response. Even for chatbots, Facebook or other channels. Fast response times give a professional first impression of the institution. Flyers and brochures work especially well for B2B customers — spreading them around companies is an easy way to increase reach.

Want to start making — where to get information?

Once the audience is engaged on-site, the next big question is where to get the information needed to start making. The classical channels like websites and hotlines are definitely useful and necessary, but also time-consuming. For the purpose of understanding how to use the machines, **youtube videos**[6] are a good way to transfer

6 brigk created a video for each complex machine with all the explanations needed to start making (for example a video of laser cutter usage — https://www.youtube.com/watch?v=Ax9W-Sts4_Y

information, especially for DIY topics. Videos shown on a screen in the FabLab also help to explain particular ideas — this is an especially valuable tool in 24-hour open spaces. Another very effective way to introduce manuals to users are **QR Codes** – they simply scan the code on the machine to see a video that explains how to properly use

FabLab Brno example:

FabLab has 3 membership packages. Novice, Journeyman and Master. The only limitation is the time that members can use the space. Novice membership provides access during so-called novice hours three times a week (Mon 12-18, Wed 20-23, Fri 8-11). The crucial part about these hours is that there is always someone from the core team of FabLab available either to help with the machines/projects or to secure the operation of the shop with consumables. The middle membership allows access during novice hours + one full day during the week. FabLab Masters can access the space 24/7 without any limitation.

it. Moreover, trained, and helpful staff should be regularly around in the FabLab and available to makers. Another useful tool often used in FabLabs is its own wiki, where both trainers and makers document their knowledge, and an FAQ available to the whole community.

Membership application process

To lower the barrier for entering and applying for a membership, separating two or three levels of membership with different fees has proven effective. All FabLabs involved in the project, for example, introduced a basic and an advanced membership.

FabLab Luxembourg example:

There are 5 different memberships, adapted to the needs and financial resources of different targets. From the cheapest to the most expensive, the packages are for students, individuals, non-profit organisations, incubated startups and SMEs/corporations. The fees include access to the space and machines, as well as basic support and training. Customised support, work on specific projects, prototyping on demand and professional training (such as extensive training on 3D modeling software) are invoiced on top of the membership fee.

Systems that could help with the fees and operation:

Having an online system for the application and payment process is crucial and saves a lot of time. Fabman and Cobot are good examples of such systems.

Fabman was designed for FabLabs as a system to handle membership and payments but also to monitor and provide current information about machines. On the other side, **Cobot** was made for coworking spaces, where people come and use certain resources like rooms or machines. Both systems are good in regards to the application process, as they allow potential members to sign in on their own. An administrator only needs to approve the new members and create a smartcard for door access or to switch the machine on/off in a 24h open space.

After the self-application and being approved, the maker needs to visit once to pick up a badge and sign a safety and liability waiver. The main purpose of this waiver and the according presentation is to point out the dangers and keep the makers safe. After these steps, the maker can start working on DIY projects.

Makers empowerment

As mentioned above, having QR codes on the machines linked with Youtube videos demonstrating their use significantly helps to empower the makers. All the handbooks from each machine are available next to the machines and access to laptops makes it easier to research certain questions/resolve problems. Moreover, the Cobot system has a feature to connect with other users and ask questions or even report incidents to the staff. In addition, a Facebook group moderated by the FabLab can be very helpful. In all cases, it is about empowering the people to solve their problems on their own and not to solve all small issues for them.

Another empowerment tool is having a set of golden rules on site and visible. These rules can cover machine usage, cleanup procedures, and more. If a question cannot be answered by the staff, they should be connected to other makers or even to professionals outside their own network.

In FabLab Brno, we call these golden rules “FabLab Rulez”. There are main rules that apply generally to the entire space and then every advanced machine has its own rules. You can find the whole set of rules online and also on site. One of the examples:

Take care and show respect

- Although the machines have been carefully selected and adjusted to provide the highest possible safety standards, the number one priority is to treat them with respect. Taking care when using them not only benefits you, but also other users.
- Tutorials and step-by-step guides are present on wiki, or workplaces. In all cases, when you are not sure about something, don’t be afraid to ask!

Regarding the machines, the FabLab is responsible for maintaining and keeping the machines running. The members are liable for the correct use for the machines and tools. This includes correct handling, the observance of safety rules, and cleaning up the machines after use. Therefore, it’s necessary to provide the instruction manuals of each machine, provide training — either free or paid — or have supervisors who support the members. An additional way could be to provide videos showing the most common ways to use a certain tool, including quick tips and troubleshooting. The needed skills/training and possible restrictions for using certain machines depend on the risks of using it.

To meet different needs of users, a separation in tool usage can be created based on skill levels. The hobbyist gets a different or more restricted room access than the professional user. Suitable tools are separated by rooms with different price models to also be more attractive to more target groups.

A reservation tool is recommended to provide equal and fair access to the machines. Reservations have priority access to machines and tools. An online tool for this process means that users can see if a machine they need is available before traveling to the makerspace.

Workshops

For learning intensively how to use machines or produce nice results, the FabLab should offer courses and training. These can include training courses on certain techniques or machines (How to use a laser cutter, vinyl plotter, 3D printer, CNC router, Safety, Arduino, Fusion 360 etc.) and workshops/courses for creating your own product (like a wordclock for example or make your own T-shirt).

brigk examples:

Trainings: Safety Instructions, Welding (MIG, WIG), Laser Cutting, 3D Printing, Soldering

Workshops: Arduino, Raspberry Pi, Adobe Illustrator, Sketchup

Product Workshops: Wordclock, Useless Machine, Smart Mirror

FabLab Brno examples:

Trainings: Laser, 3D Printer, CNC Basics, Vinyl Plotter, Embroidery Machine Basics

Advanced training: 3D Printer Advanced, Laser Cutter Advanced, Embroidery Machine Advanced

Academies: CNC Academy, Fusion360 Academy, Arduino Academy

Workshop type events: Make Your Own Chopping Board, T-shirt, 3D Printed Figure, Bowtie

Technoport examples:

Trainings: CNC Router, Laser Cutting/Engraving, 3D Printing, Vinyl Cutting, 3D Scanning, Molding & Casting, CNC Milling, Electronics (Arduino)

Advanced trainings: 3D Modelling, Laser Cutting Masterclasses

Workshop type events: Biomaterials, Researcher Days, Aquaponics Discovery Workshop, Build Your Own 3D Printer

Workshops typically cover topics related to manufacturing techniques, training in handling the existing machines, software handling, product workshops and covering the needs of companies, like team building workshops. The following table shows examples of training sessions for different groups:

Target group	Topics covered	Features
Workshops for private makers	machine training, product workshops, topics suggested by employees or the community	held on a regular basis or on demand inhouse, cost covering ticket prices open to everybody
Workshops for startups and entrepreneurs	machine training knowledge workshops (e.g. How to prototype, manufacturing techniques)	organized on demand inhouse
Workshops for companies and stakeholders:	FabLab as an event venue, team building workshops machine training lectures on related topics	
Workshops for pupils/students:	machine training, product workshops, knowledge workshops (e.g. How to prototype, manufacturing techniques)	free access for participants (paid by municipalities etc.) inhouse or at schools/universities (e.g. FabLab Experience Truck operated by FabLab Brno)

Support

Makers can get support from the staff, which are available at certain hours (e.g. Fridays from 2:30PM to 8PM or by appointment) in the FabLab, or through a system like Slack or Mattermost. Platforms like these not only let users get help directly from staff, but also from other members of the community. These applications have the advantage of being less public than a Facebook group — we recommend using the Facebook group for inspiration from projects makers work on. For more difficult issues, the FabLab staff can hire experts in requested areas as an extra paid service.

Regarding materials, in most cases the material is brought by the maker, but if certain things cannot be purchased by the single maker, the FabLab staff helps to order the material and bills it to the maker. A certain set of materials should always be on site so makers are able to run machines at least at a basic level. This could be — to name some examples — basic PLA filament for 3D printers, resin for SLA printers, solder and basic electronic parts or filler wire for the welding machine.

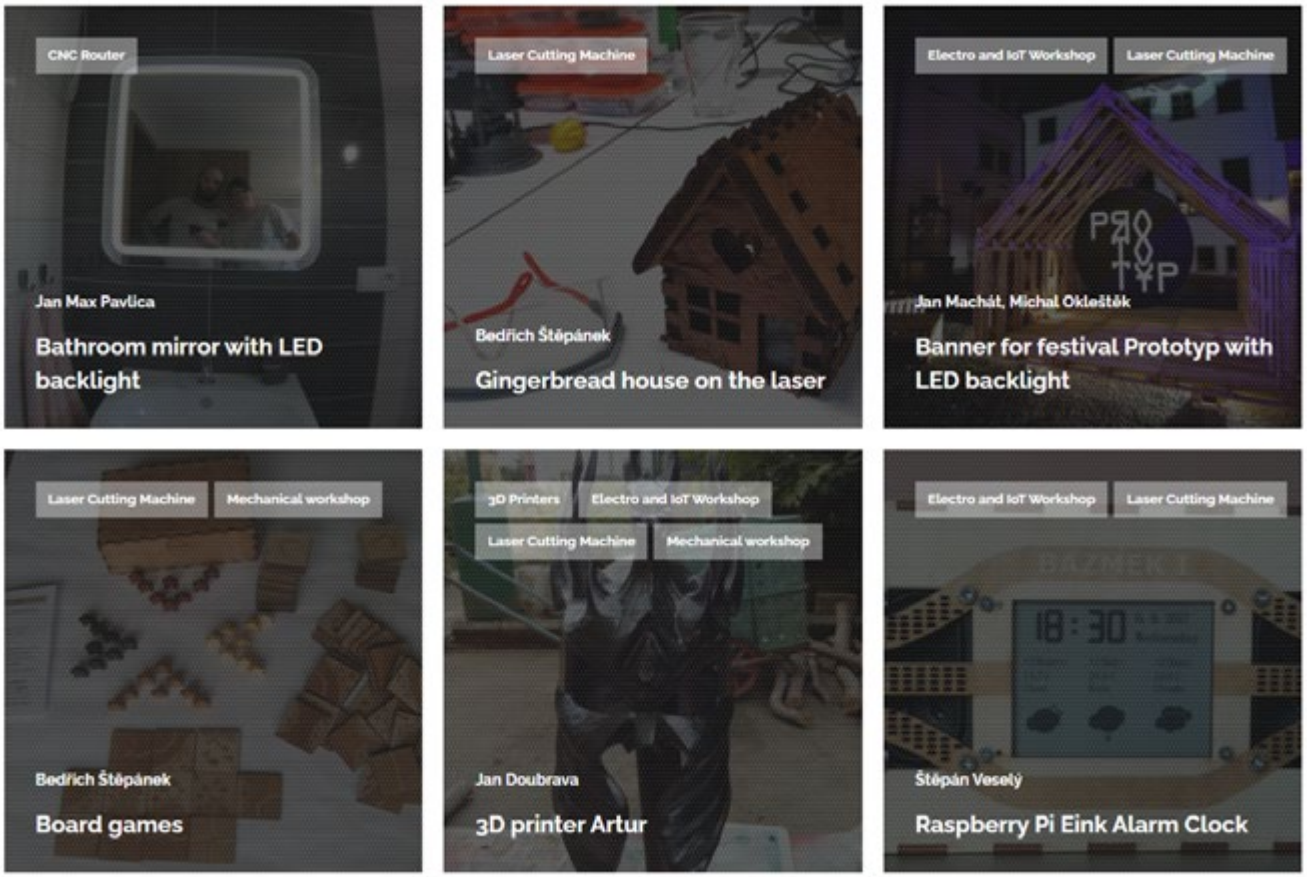
In Luxembourg, members have access to the machines from Monday to Friday from 10AM to 7PM. Machines can be pre-booked through a shared online calendar to ensure that they are free. During those opening hours, a staff member is always available to provide basic guidance and support. There is no fixed limit to the support in terms of e.g. fixed number of hours per member but members are expected to develop their projects to the point where files are ready for digital fabrication and shouldn't prevent other users from having fair access to the space and staff members during open hours. People requiring the staff to work more extensively on their project can hire a specific staff member as needed. This assistance is subject to the payment of extra fees.

Visitors, new and existing members, and startups are encouraged to absorb new manufacturing techniques through the inspiring projects and products of other members. Quite often this exposure leads to the creation of new ideas and solutions. New opportunities open new roads and support people thinking outside the box. Therefore, it makes perfect sense for FabLabs to have some kind of showcase for what is created in their workshops.

Product shelf tips:

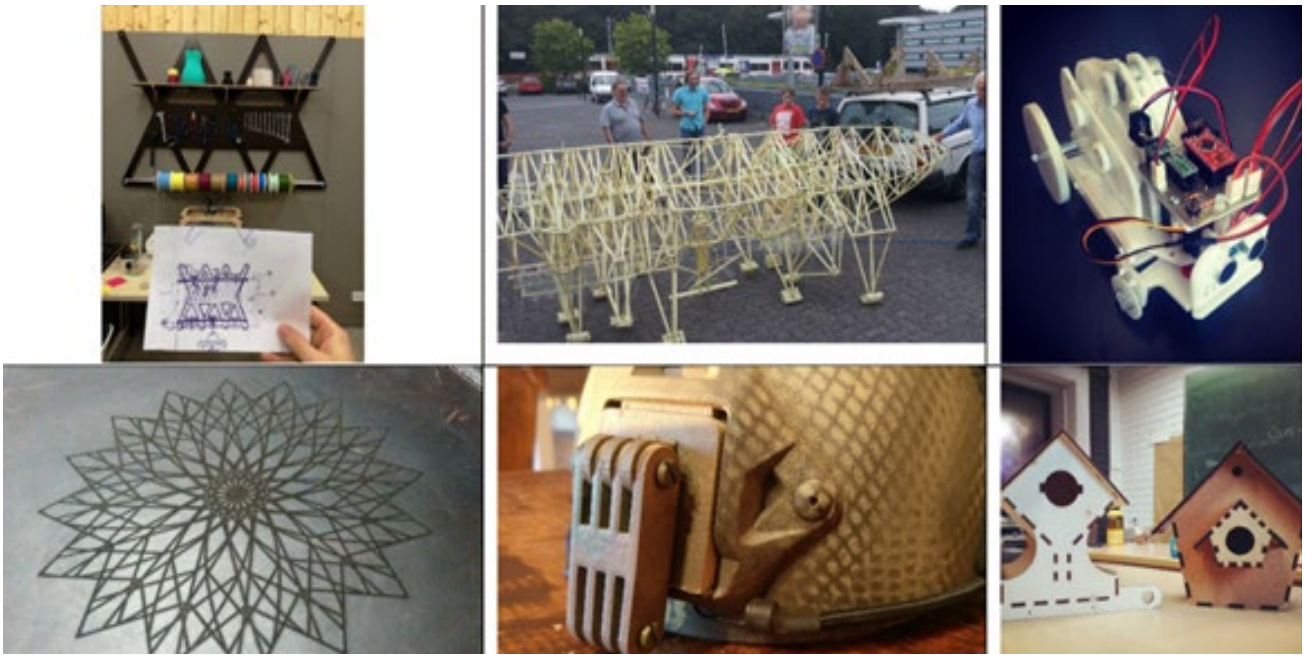
FabLab Brno has a product shelf on site. TIP: If you plan to prepare one too, be ready to continuously remake products that get lost or broken :)

The “Made in FabLab” webpage section: https://www.fablabbrno.cz/made-in-fablab/



Another already-mentioned source of inspiration is social media. Connecting the creators and collecting their ideas in specified groups on Facebook, Instagram, YouTube or Twitter accounts and websites can encourage others to get active.

https://fr-fr.facebook.com/fablablux/
https://www.instagram.com/fablablux/
https://www.youtube.com/channel/UC0E6fGcs_KXoM7RVYtlF7kg
https://twitter.com/fablablux?lang=en
http://fablablux.org/bb_project/



Small, on-site exhibitions of created content in the workshops — as an actual object on shelves or as photos — make it easy to show interested persons what kind of projects are possible, often as stepping stones to even more impressive ones.

Maker Faires

Events specially organized to give creators a platform to showcase their projects or discuss recent or upcoming projects are perfect places for a maker to gain valuable feedback and offer inspiration to others.

Maker Faires or FabFest can serve nicely. Find a fair nearby: https://makerfaire.com/map/. These are great opportunities for year-round makers to show off their hard work and inspire thousands of others to get involved, too.

FabLab Brno experience:

We have teamed up with the local event Prototyp — an event for thousands of people that centers around art, science, and technology. The first year we just had some workshops, for the second one we had a decent-sized meeting room and the third year we paired with Maker Faire organizers and managed to cover a whole pavilion of around 5000 m2. One third of it was a FabLab zone, with some of our projects but mostly those of our members.

Network of stakeholders

The network of a FabLab consists of internal and external connections. The most genuine touchpoint is the incubator embedded in the FabLab's ecosystem. For this reason, there must be structures to keep in touch, such as regular meetings and events. Each part of the organisation should also try to involve the counterpart in as many activities as possible to make them visible to internal and external participants.

Startups, founders, creative professionals, and coworkers are a natural part of the ecosystem of the innovation centre, as they are in touch with most parts of it on a daily basis, so it's possible to involve these people with minimal effort.

As FabLabs also serve as a kind of educational institution, connections to universities and schools — especially technical schools — should be very close. Teachers can take advantage of the equipment, space, and expertise for their lessons and lectures, provide the pupils and students with interesting content and different ways of teaching various things. On the other hand, FabLabs can be provided with new inputs and information from research institutions and receive support in learning to teach.

The municipality and region where a FabLab is located is another external network partner. Mainly the FabLab can provide a range of support for it, such as manufacturing furniture or organizing/participating in social projects. In return, it receives good publicity, reaches new target groups, and increases awareness. Local representatives can support the FabLabs by partnering with relevant organisations or by sponsoring.

Large companies, mid-caps, and corporations are a highly important part of the network. They can offer financial support through sponsorship, provide machines, materials, supplemental services, purchase workshops — either machine training or teambuilding events — or take advantage of the FabLab as a venue for events. The companies can thus connect with makers, startups, and professionals to benefit from their expertise and different ways of dealing with problems and challenges.

Community of makers

Building a strong community among the users of FabLab has a lot of advantages. Identification grows by being connected to others and bonds the users, especially when collaborating on projects. The community can also provide knowledge to both new and existing users who want to learn a new machine or manufacturing technique.

The bonding between the members can be achieved in different ways. Open door events — like anniversaries, open labs and discussions on maker topics — are perfect for people giving people a positive first experience of the FabLab itself and the people working and creating there.

Community projects are a good way to bring together makers with different interests, knowledge, and ages. This is why ideal projects cover a wide range of needed skills, but are simple enough to increase participation from as many people as possible. In addition, the project should have a higher purpose. Good examples include building something for the community, such as machines, or projects related to what's going on in society, so the results can be shown and represent the spirit of the FabLab.

Did you know that without Adele Goldberg, we would not have the GUI in the first computers?

A respectful and supportive culture in the makerspace is essential. Studies show that there are four times more male makers than female makers.[7] To attract more women to a FabLab, here you will find some useful tips:

- Cooperation with local initiatives supporting women in technology and entrepreneurship. As a good practice may serve cooperation between FabLab Brno and Czechitas House. Czechitas is czech non-governmental organization which helps women to explore the world of information technologies. Czechitas teach them to code in various programming languages, test their software, or analyse complex data, organize workshops and courses on different levels of expertise, focused on particular knowledge or technology. Since 2017 Czechitas organize women maker workshops with FabLab with ambition to increase digital skills and introduce new technologies.Moreover, in 2019 Czechitas opened a new IT community center for women where small FabLab is in place.
- Role models are needed in the most diverse situations such as teaching maker skills, managing a makerspace, organizing an event, etc. Our recommendation is to involve female tutors and mentors in FabLab.
- Moreover, what is needed are ‚success stories' that capture the attention of potential female makers. Not just success stories of female makers, but of women in technology. Here is one example:

Hedy Lemar set the foundation for the satellite communication system and Samantha Payne runs Open Bionics, a company that is turning disabilities into superpowers. Amazing, right?!

7 Voigt, C., Unterfrauner, E., & Stelzer, R. (2017). Diversity in FabLabs: Culture, Role Models and the Gendering of Making. In International Conference on Internet Science. Thesaloniki, GR: Springer

Membership Termination

Membership termination by the user is possible as written in FabLab's Terms and Conditions and depends on the runtime of the subscription. One option is to enable members to cancel online on their own. One drawback to this option is that you rarely find out the reason for termination. This is the main reason why it's better to require that termination requests be submitted in person, or at least by mail.

Even after terminating their membership, ex-members often still want to stay in touch with the FabLab, so it's a good practice to keep their account in the system so they still receive newsletters and can reactivate their membership at any time.

Terminations of memberships by the FabLab are only possible for important reasons. This includes improper use of the equipment, breaking (safety) rules, or damaging property.

FabLab Experience— mobile FabLab

Not everyone from the 1.2 million inhabitants of the South Moravian region has easy access to means for bringing their ideas to life. That's why there is a mobile version of a FabLab called FabLab Experience. It is a full-size trailer with a foldable side that houses a basic set of FabLab equipment. It is meant to support the entrepreneurial spirit in youngsters through digital manufacturing experience. Distance is no problem with the truck. It travels around the region and makes stops usually for 5-14 days and during those stops holds workshops for students 14–19 years old.

Afterschool sessions are open to the public and there are around 20 days a year that FabLab Experience is connected to festivals, fairs, events, conferences, public events, company anniversaries etc. The key benefit of a mobile FabLab is that there are no barriers and it helps to attract new users to the stationary FabLab facility.

To fulfil the main aim of this chapter, business model canvas methodology has been applied in order to describe all relevant aspects of a successful FabLab business model. Each component of the business model is complemented with the practical experience of all FABLABIA partners.

Customer segments

The market segments typically targeted by FabLabs and addressed by the three members of FABLABIA include students and entrepreneurs. These groups are also usual targets for business support organisations, making them the core stakeholders to consider for the provision of joint entrepreneurial services from FabLabs and business innovation centres.

New FabLabs should focus on targeting customers with pre-existing business relationships or those who have already been initiated by the business innovation centre or the FabLab's other shareholders. This is the case of entrepreneurs and potential entrepreneurs who are being proactively scouted by the business incubators in their respective ecosystems.

General makers are common users of FabLab Brno and brigk, while Technoport targets more specifically creative industries. Technoport's model is recommended for cases when companies supported by the business incubator are mostly B2B-oriented and the business innovation centre is therefore not being widely visited by the general public.

Based on their strong demand for FabLab services, **technology entrepreneurs at a very early stage** are especially valuable as a customer segment. Further partners of business innovation centres, including corporations, universities, and research centres, however, should be as involved as possible in the activities of the FabLab too, in order to diversify the community members. The availability of these clients in the ecosystem should be assessed based on the following criteria:

- there is a critical mass of such potential end users in the FabLab's city or region
- have the possibility to come to the FabLab's location
- the target customers are sufficiently funded to pay for the services of the FabLab and make it sustainable

The support services available from the FabLab are especially relevant for entrepreneurs supported by business innovation centres in the initial phase when they have to convert a business idea into a viable concept and then a specific product offer. This is, however, a potentially costly market segment, with a lot of time typically dedicated by the staff of the FabLab to product development activities, at a stage when the entrepreneur may have limited cash for the project and therefore limited ability to pay.

From the experience of the members of FABLABIA, high-technology companies backed by investors as well as corporations offer the highest return on investment and should be heavily targeted to fulfil Criteria #3. Technoport offers them access to the machines while brigk is mostly offering the FabLab as a place for team building events, workshops, and social gatherings. FabLab Brno offers them unique marketing opportunities with the FabLab Experience and there is an example of a corporate company that built their own small prototyping facility right next to the FabLab so their employees can use both and mainly be inspired by regular users. Overall, team building events may be easier to implement than the use of the machines since corporations are well-funded enough to either acquire their own prototyping equipment or have partnerships with external commercial

partners in the field. Their need for a FabLab is therefore lower than that of other potential clients, and machine and knowledge sharing don't fit into their productivity requirements, let alone their specific rules and working procedures. Their involvement in FabLab prototyping activities should however be considered and investigated, based on a thorough analysis of the regional business landscapes and the core activities of target stakeholders.

While large industrial corporations may already have sophisticated in-house machinery and may not be willing to enter into co-creation activities with external makers, **service-oriented companies** will be keener on using the services of the FabLab for their needs, such as the production of some demonstration material for fairs, packaging, or marketing goodies. On the other hand, industrial corporations may be very keen on being supported in their innovation processes, thinking out of the box, getting insights from external stakeholders, and being brought out of their usual environment as well as their comfort zone. In both cases, the FabLab as an external service provider is worth considering.

As already mentioned, **researchers and academics** should be considered as well though their easy and active involvement is very much related to the entrepreneurial profile of the institution (are they used to and interested in collaborating with business innovation centres?) and the complementarity of the equipment of the FabLab with their own research and development facilities. As for corporations, non-technology-related curriculums in arts, humanities, or social sciences, for instance, may be worth considering. The FabLab Luxembourg had better results in the field of social research and social innovation than with local researchers in ICT, science, or engineering. It has thus been a partner in a project of an open and exploratory research lab at the University of Lancaster that investigates emerging issues, technologies, and practices in social sciences.

The focus on specific market segments must be in line with the main mission statement for the business innovation centre. Fostering entrepreneurship reinforces value creation and economic diversification. Highly developed entrepreneurship skills make it easier for innovation and exchanges at the FabLab between existing market players. It also provides an additional creative environment for their successful development. In both cases, the FabLab is a powerful tool for the business innovation centre to support the sustainable development of innovative companies.

Value proposition

Best practice tip:

Bid to quickly dominate a specific customer target, building upon the existing community of clients of the innovation agency, but leverage the expertise and visibility you have gained to successfully enter further adjacent market segments. The quality and diversity of the community built is the main asset of the FabLab, far beyond a mere set of space, digital fabrication services and machinery.

The value proposition of the FabLab is equally strong towards entrepreneurs and potential entrepreneurs typically targeted by business support organisations.

For students, the added value of the FabLab is about getting to learn new technologies by doing, acquiring foundational experience and turning their ideas and projects into tangible objects. In the context of a FabLab, training is all the more valuable as it is understood as a collaborative "learn by doing" or "learn by sharing"

activity and can therefore be a very good complement to classical courses. For public institutions in charge of education, the FabLab is a powerful tool for fostering inclusion and providing support to under-represented categories of students in specific fields. Some FabLabs thus offer services to promote scientific and engineering careers towards girls, the same way some business innovation centres are specifically encouraging and supporting women in becoming entrepreneurs.

Start-up companies at incubators value access to machinery they cannot afford or may not need on a permanent basis, but which is useful to them for building and showcasing their products. Rapid and cheap in-house prototyping is greatly facilitated by FabLabs. The networking effect is also very valuable to small companies that don't have all the resources they may need in their core business team. A best practice of FabLab Brno from this point of view is to provide members with direct access to the experts and mentors of the business innovation centre, a community of 100 experienced professionals who help entrepreneurs at all stages of their development. Consultancy on concepts, performance of tests, prototyping on demand, and manufacturing on demand can be of high added value to private companies but must only be considered if not already available from other stakeholders (in order to avoid unfair competition) but also if the funding available to the FabLab allows for the hiring of full-time professional staff who can dedicate themselves to ensuring that such projects are of a high enough quality to provide added value. Technology companies sometimes tend to think in terms of industrial facilities and consider the FabLab as such, not understanding well enough the educational and knowledge sharing dimension which is a core part of the model. A best practice is to make different marketing and communication materials highlighting the unique selling propositions of the FabLab towards each category of targeted stakeholders but also explaining the basic concept of the FabLab as needed. It shouldn't be considered a mere extension of the industrial, office, or co-working facilities offered by the business innovation centre, but as an additional support and capacity-building service available to the entrepreneurs. The value proposition towards innovative businesses should be heavily explained and communicated by the business innovation centre, which is considered a key and very valuable distribution partner for the FabLab towards those specific stakeholders.

The value proposition of the FabLab should also be defined considering the broader vision and mission of the business innovation centre:

FabLab Brno	The aim is to have more R&D jobs in the region by further educating people and contributing to an increase in the number of research and development activities performed at the local level.
brigk	The motivation is to bring business diversification in the region and develop new types of industries. The positioning of their FabLab is subsequently one of a self-empowering, self-educating peer-to-peer community of stakeholders able to foster change and innovation. This is considered the most relevant positioning model for a FabLab of a business innovation centre with a mission of social or educational development in terms of economic development and renewal of economic pillars in the target region.
Technoport	The focus was more on filling gaps in the existing ecosystem in terms of services provided to established organisations, strengthening the offer towards existing research and innovation activities spread among different sectors. A lot of attention was subsequently paid to the value for money of the FabLab and its ability to be smoothly integrated as an additional market player in some existing business chains.

Those different positions illustrate the richness of the contributions a FabLab can provide in terms of economic development and innovation strategy. The value proposition should be considered from many different perspectives, taking into account both the practical short-term needs to fulfill and the longer-term social value which can be expected in the region.

It is interesting to note that as 3D printing, for instance, becomes increasingly affordable and is going mass market, the value proposition of the FabLab for business innovation centres still remains strong, as the focus is increasingly being put on the community-building dimension and the social cohesion impact induced in the ecosystem. The situation is different in mature economies and in emerging markets. There is a very strong demand and market opportunity for on-demand prototyping and manufacturing in countries where there is a rapid transition towards digitalisation. In such ecosystems, especially if human resources can be hired at an affordable price, there is a clear interest and reason for positioning the FabLab as a technology enabler for local stakeholders.

Good practice tip:

The FabLab should be completely credible as a provider of services to the target end users and an obvious partner for them to engage with. To achieve this positioning, the unique value propositions have to be clearly communicated to the communities of stakeholders, with a specific message built towards each market segment.

Like for business incubators, the entrepreneurial impact of the FabLab should be monitored and measured through quantitative and qualitative KPIs in line with its mission and vision. This is considered a best practice and some benchmarking may be performed in this field inside networks of FabLabs, as it's already being done in business innovation centres networks like EBN (www.ebn.eu).

Resources and activities

It is recommended to combine a mix of activities serving specific needs with some generic events in order to bring the entire community together.

Core activities for FabLabs include training and workshops, which may not be limited to technical subjects in a FabLab associated with a business innovation centre. FabLab Brno, for instance, offers a pricing workshop for makers in close collaboration with JIC. At Technoport, mainly technical subjects are covered but the offer is enriched by very specific topics derived from the expertise of startup companies from the national ecosystem. In the field of new materials, for instance, makers and designers were trained on the potential of Mycelium, a versatile biomaterial made from mushroom root systems in collaboration with the Luxembourgish startup Mogu.

FabLabs can contribute to different innovation activities, not only from a technical point of view but also by bringing people together, reinforcing their soft skills, their creative capacity, and their ability to work together. Boundaries should be set, however, so that the networking activities do not interfere too much in the daily work of professionals and startuppers, who need to deliver. Some days/hours can be exclusive to entrepreneurs/professionals/startups and others more focused on mixing different profiles.

The activities offered should be heavily prioritised based on the specificities of the local ecosystem. An analysis

of the competitive landscape is highly recommended, and the model should be adapted and refined based on the evolution of the economic and technical local environment. Though general makers tend to be interested in exchanging with peers and sharing common interests, companies are more focused on having access to complementary resources versus what they have in house. This is especially true for startups who will have to complement their team until they can reach the growth stage.

Corporations, in contrast, tend to use the facility more than the expertise itself, to think out of the box, be in an external environment, enlarge their innovative potential, and open up to the outside world. This need has been well-acknowledged by brigk that successfully offers innovation supportive events to corporations in exchange for sponsorships.

Some activities of the business innovation centre may be performed on the premises of the FabLab whenever the space is considered suitable. brigk thus uses the FabLab for some competitions and together with the Lycée des Arts et Métiers in Luxembourg, Technoport shall have ideation programmes for students, pitches, and hackathons performed at the FabLab from 2020 on.

In terms of rapid prototyping activities, it is worth reemphasizing that a fully commercial-ready solution can be expected by some entrepreneurs and that the specific time, expertise and level of service required may exceed the mission and practical capacity of the FabLab. Business innovation centres typically face similar challenges in terms of business development activities, the leadership of the company having to remain under the responsibility of the entrepreneurs, even when extensive coaching and strategic advice is provided by the agency. They can and should work together with the staff of the FabLab to share their experience about managing customer's expectations, if any, and support a clear strategy to be set at the FabLab from that specific point of view. A specific committee may be established between the business innovation centre and the FabLab for governance purposes, which should meet on a regular basis. e.g. four times per year.

In terms of human resources available at the FabLab, design skills are typically appreciated by technology companies while the general makers and students value experience in mechanical and electrical engineering. As a minimum, it is recommended to have a mix of both profiles available at the FabLab and make use of the business innovation centre for further resources and expertise.

Good practice tip:

The FabLab shouldn't aim to cover all technical needs but focus on properly fulfilling a specific value proposition for each customer market segment. This is best done by developing a set of products and services complementary to the specific strategic mission of the business innovation centre and which haven't been fully provided yet in the target ecosystem. The resources and activities of the business innovation centre should be called upon to extend the range of services offered by the FabLab and build some relevant joint initiatives in the fields of e.g. "on-the-job" training or co-creation processes.

Customer relationships

The relationships of the business innovation centres can typically be leveraged to bring customers to the FabLab. Innovation centres are well connected to entrepreneurs and corporations and can bring them to the facility.

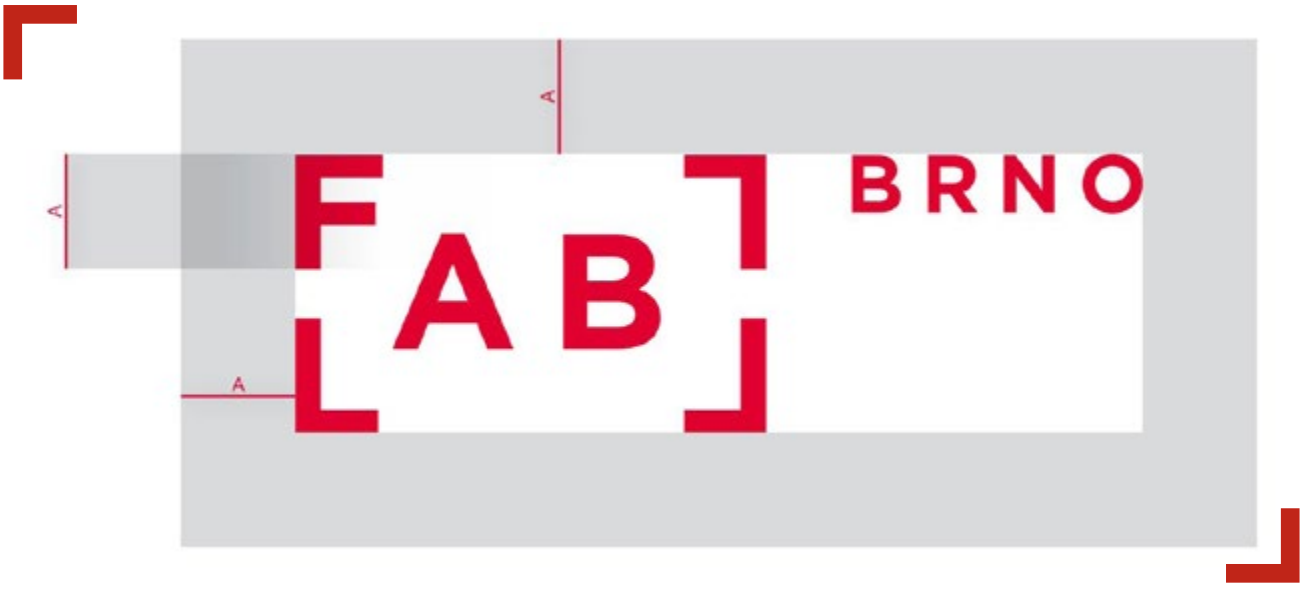
In contrast, the FabLab is a good entry point for business innovation centres interested in working with students, fostering social entrepreneurship or forming some public-private partnerships.

There are three pillars involved in the business model of FabLabs, one being focused on technical and business innovation, one being related to education and one being oriented towards community sharing. In terms of customer relationship, the business innovation centre is key in bringing and managing the first dimension, while the FabLab can provide strong added value in bringing people, knowledge, and creative ideas together, thus fostering entrepreneurship inside the entire value chain. It is recommended that the FabLab and business innovation centre each focus on their core mission and fulfil a slightly different role inside the ecosystem while working together at the same time, having a clear and distinctive identity but sharing their networks and resources as needed.

Branding tips:

Branding is a very important exercise to perform when establishing the FabLab and shouldn't be underestimated, even though the structure is not commercial-oriented and has the status of a non-profit organisation. For example, FabLab Brno developed its own communication strategy and corporate identity with only limited visual similarities to the branding of JIC, though the FabLab is continuously labelled as being "powered by" the business innovation centre.

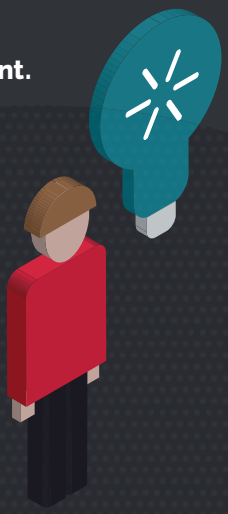
FabLab Brno's example of branding, you can find the full version here:



ENGINEER

The main character traits:

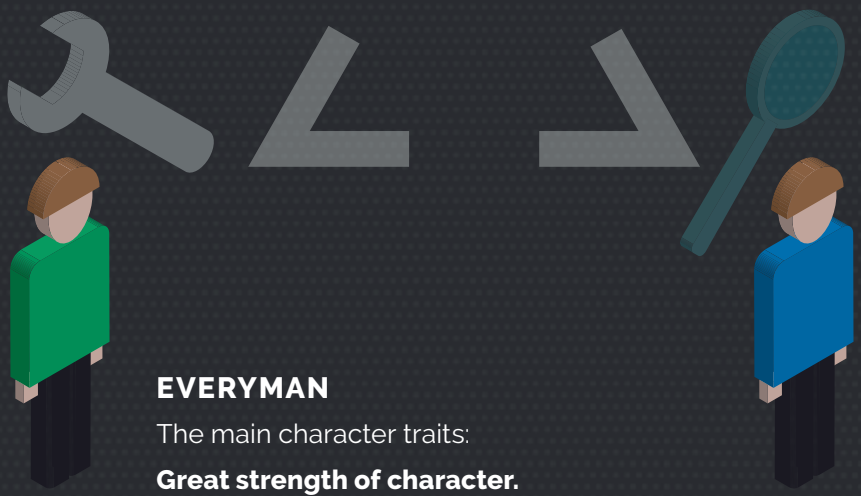
Practicality. Sensibility. Engagement. Honesty. Groundedness. Patience.



SEEKER

The main character traits::

Tireless inquiry. Honesty. Self-reliance. Flexibility. Open mind.set.



EVERYMAN

The main character traits:

Great strength of character. Faithfulness. Supportiveness. Usefulness. Functionality. Resourcefulness.

It is recommended to offer visible, open, and easy access to the FabLab if the premises are being shared with the business innovation centre or some other stakeholders. The location of FabLab Luxembourg at the 3rd floor of the business incubator and far away from the lifts was far from ideal. It made it difficult, for instance, to organise open houses.

For FabLabs oriented towards professional end users, expectations from companies may be tricky to handle and some clear collaborative frameworks and standard agreements need to be drafted to manage the relationship and set some limits. From that point of view, the expertise of business incubators, their potential experience in collaborative research, and easy access to their legal partners are considered an added value in defining the specific vision and mission statement of the FabLab as well as its terms and conditions. It is recommended to have some standard project agreements to set out the nature and the scope of the projects handled by the FabLab and the tasks and responsibilities of the involved entities, with a clear financial arrangement and some limits. The staff of the innovation centres should ideally be called upon for co-screening the requests of FabLab end users in terms of product and business perspectives and expectations. Business innovation centres can consider to offer or develop complementary technical support services as needed by some entrepreneurs (Technoport thus offers living labs, support for DX/UX design, matchmaking with technical partners, testing and validation of products, and information on technical regulations for compliance purposes). The other way round, the FabLab can be integrated into some research or business agreements signed by the business innovation centre whenever they can contribute and provide some added value

Though the services tend to be offered mostly to the locals, customer relationships can be built and actively sought at broader national or international levels. In the case of Technoport, the FabLab has been a very powerful tool for partnerships with business innovation centres abroad. It has been an easy and practical entry point for collaborations as well as bilateral agreements with business and innovation centres located in far-away ecosystems, especially in India, where the positioning of the FabLabs and their added value for business innovation centres appeared to be similar but with a very strong complementarity in terms of machinery and resources. The links could then be leveraged by the business incubators to trigger more complex and sophisticated exchanges, focused, for example, on exchanging startup companies and co-distributing products.

Good practice tip:

The FabLab should be easy to reach and able to bring together different target beneficiaries. It is recommended to build a strong corporate identity for the FabLab which not only establishes strong ties with all target stakeholders but also supports customer retention. The complementarity of the distinctive offers of the FabLab and the business innovation centre should however be extensively leveraged to develop and implement some bundled customer relationship based on joint service offers.

Sales and marketing channels

Both JIC and brigk offer free FabLab tours every week which are an opportunity to showcase the FabLab to interested newcomers. Technoport had the FabLab located at the heart of its incubation premises, which allowed easy access for companies and contributed greatly to bringing them to the FabLab. The marketing of the FabLab was however strictly related to the sales and marketing channels of the business innovation centre. This lack

of independent marketing efforts from the FabLab is considered a weakness in the business model, as it has prevented the acquisition of a large enough community of stakeholders. Business innovation centres should ensure that their FabLab has its own resources to call upon the relevant communities of interest at regional or inter-regional levels. A staff member with a business- or sales-oriented profile is considered of added value.

The marketing and communication channels have to be adapted to the main target audience. As examples, Technoport has relied on emailing and lectures, while the marketing strategy of FabLab Brno has been heavily oriented towards public events, maker fairs, FabLab tours, Wiki Pages, and Facebook groups.

All three members of FABLABIA agree that word of mouth plays a big role in promoting a FabLab. brigk uses Cobot to further encourage and support direct communication between members, which is considered a best practice. Moreover, they've implemented a distinctive and professional marketing strategy by investing into paid campaigns, performing showcasing activities, and making presentations towards local newspapers and media. Those activities have provided good results and are considered important in terms of visibility. Maker fairs should be organised and attended. When people were less familiar with 3D printing, it was valuable to bring the smaller machines to some local exhibitions. Nowadays however, showcasing the results of the work done at the FabLab seems to be more relevant and rewarding. Some Farm bots can, for instance, be placed in public gardens or showcased at gardening fairs. Works manufactured for external stakeholders and put in places where there is a large audience can be labelled as having proudly been made at FabLab, possibly with a QR code and a link to the website of the organisation.

Good practice tip:

It is recommended that the FabLab develop its own sales and marketing channels while benefiting from the networks of the business innovation centre. A business, marketing profile, or community manager should be called upon as needed.

As a minimum, it is recommended that FabLabs have their own social media and website and use direct marketing channels towards their communities of members. However, co-marketing of the FabLab and the innovation centre is worth considering as a way of attracting sponsors and corporations. FabLab Brno has greatly benefited, for instance, from the in-house incubation programmes and scouting activities of JIC towards companies like Honeywell. In the case of brigk, the connection of the incubator manager to the employees of Audi has been determinant in acquiring support from the company for promoting and marketing the FabLab. The other way round, the FabLab has been a powerful tool for attracting additional corporate clients for the innovation centres, using corporate social responsibility as a selling entry point. It has also been supportive of the efforts made towards enlarging communities of entrepreneurs in the business incubators and attracting under-represented profiles. FabLab Brno has thus contributed to attracting women in technology fields, as well as securing connections between JIC and student associations, while Technoport has been considered by some rehabilitation centres to offer specific services to disabled communities of entrepreneurs based on the 3D printing and prototyping potential offered by its FabLab.

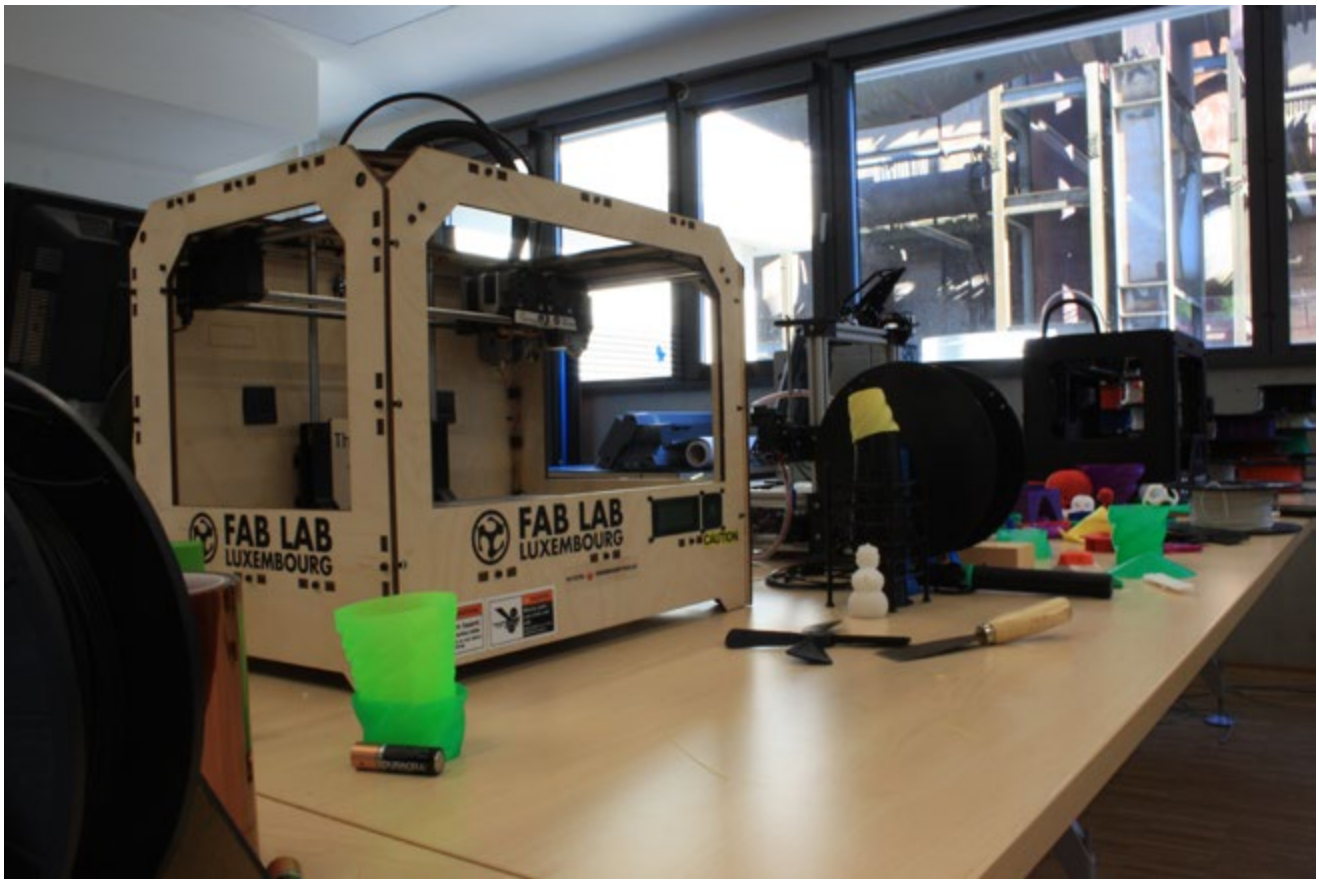
A good practice of FabLab Brno has been to promote the FabLab as a communication and marketing tool for some corporate clients interested in enhancing their image as innovative organisations, strongly engaged in terms of corporate social responsibility and supportive of the local people. This has been effective in attracting sponsorships for the FabLab.

If not a core specificity of the business innovation centre (not being a living lab or an open innovation hub), it is

definitely a good practice to develop some co-creation services in the FabLab itself which can benefit the business innovation entity. JIC thus considers its FabLab as a very strong marketing and educational arm which puts them in a position to reach further end users.

Key partners

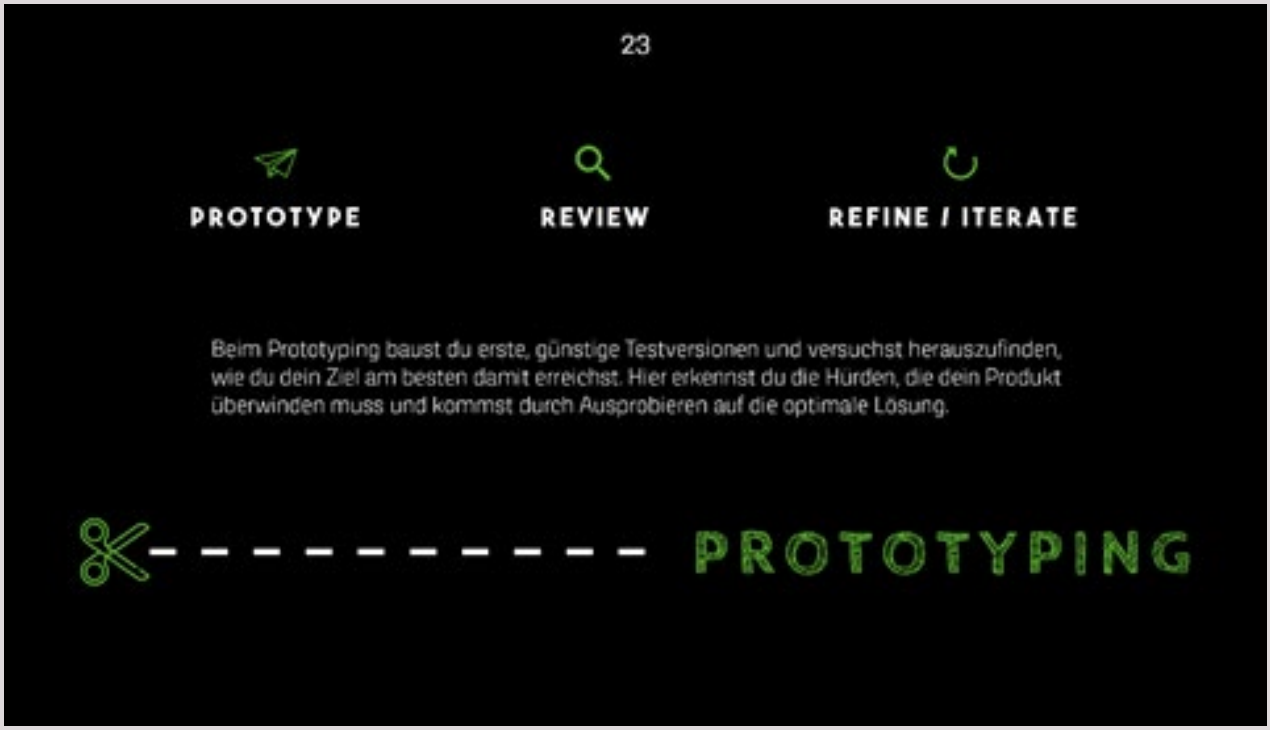
One especially important aspect of the business model are the funding partners of the FabLab, though these partnerships have to be considered with different scopes in mind. It is recommended to assess the potential value of partners by taking into consideration what they bring in terms of community building, expertise, reputation, and positioning in the value chain, in addition to the money they could provide. Core partners of the FabLab should ideally integrate the two dimensions and, if possible, be aligned with the mission and activities of the business innovation centre too. They should be heavily involved in the daily management of the FabLab and its activities. At Technoport, for instance, the link with the entrepreneurs initially interested in setting up the FabLab was lost after the FabLab had been operating for some time. The advisory board of the FabLab has been subsequently transferred to more heavily committed stakeholders. The new core partner of the FabLab is the Lycée des Arts et Métiers in Luxembourg. They have a partnership with both the FabLab and the business innovation centre and offer a soft landing space for innovative companies developing technologies in the fields of augmented reality, virtual reality, IoT, or EdTech, as well as prototyping and product testing activities for startups companies with the support of their teachers and students. As a higher education institution, the technical high school is moreover very well-funded since high education is currently a top priority in Luxembourg and resources are expected to continue being invested in the sector. The partner is therefore greatly contributing to the long-term sustainability of the FabLab.



A best practice is to work with partners who understand the values and mission of the FabLab and the business innovation centre and resonate with those two organisations in terms of activities and objectives. Serving a large commercially oriented sponsor organisation, for instance, while having a strong non-profit/educational core goal may be a bit challenging and induce some confusion and misalignments in terms of communication. Such partners should not be founding members, as this can create a feeling of ownership that can lead to conflicts regarding the values and vision of the FabLab and shouldn't be given a very strong role or decision-making power regarding the vision and mission of the organisation, leaving the lead ideally in the hands of the business innovation centre.

"Entrepreneur Bible for FabLab makers" by brigk:

Brigk created comprehensive guidelines supporting FabLab makers in product development and entrepreneurship. The document guides makers from the first idea to final product using lean canvas methodology and encourages makers to test and verify their ideas with potential customers. The document is available to makers in Fablab.



The possibilities in the local ecosystem (proximity being key in the partnership) should be investigated, however, and all potentially relevant partners approached. Key departments to target are the ones in charge of innovation. Their vision and mindset are close to those of the FabLab and they are usually on the radar of the business innovation centres. The networks of the business innovation centre should be heavily shared and used to provide access to corporations for the FabLab beyond equipment builders and machinery suppliers. This is a common best practice of all three members of FABLABIA. The recommendation is to search diversification in terms of partnerships and position the FabLab as a cross-vertical tool among different industries. Further partnerships may be accessible and sought through the business innovation centre, towards institutions fostering entrepreneurship

and the acquisition of technical skills inside the region. This has been the case of the Lycée des Arts et Métiers for Technoport and organisations targeting specific groups for both Technoport and JIC (with partnerships established with public and private organisations supporting entrepreneurship among groups of disabled people, students, and women).

It is recommended to align the timeframe of the key partnerships acquired for the FabLab with the timeline foreseen in the financial budget and plan for being break-even. A good practice of brigk is to secure long-term engagement from their corporate partners and agree on a timeline of 15 years in order to remain sustainable. On top of providing a lot of stability to the model, this has given them enough time to recover the costs of the machinery and has allowed them to gradually build their portfolio of services and their community of stakeholders with a long term vision. Our experience is that it takes time for a FabLab to become sustainable. Shareholders should feel comfortable with a rather long-term return on their investment. Technoport initially built its FabLab with the support of a local entrepreneur/business angel but had to turn to longer-term alternative funding partners after two years of operations. Follow-up funding partners were the municipality of Differdange and finally the public technical high school mentioned in the previous sections. Cities and schools are also worth considering as they may be able to provide access to free buildings or low-cost rented spaces, as well as facilitate access to further public institutions.

In terms of financial partners, the corporations in the networks of the business innovation centre are worth being leveraged. brigk could secure Audi as a founding partner, Technoport and FabLab Luxembourg worked with the engineering multinational Paul Wurth and some other FabLabs abroad have reported similar agreements with corporations (e.g. Engie or Orange in France, key strategic support partners to both incubators/accelerators and FabLabs). Corporations are of very high interest as partners as they are well-funded and can bring a lot of visibility to the FabLab through events and by promoting it through their marketing channels. However, some further stakeholders can be better aligned with the economic development mission of the business innovation centres and provide access to valuable stakeholders for the FabLab in the fields of education and social impact. Business innovation centres and FabLabs with a strong focus on employment and education should consider working with universities (a core dimension of FabLab Brno, for instance), while those interested in fostering social diversity and inclusion can work heavily with NGOs. FabLab Luxembourg has thus organised workshops with Engineers Without Borders, a non-governmental organisation supporting the world‘s poorest people and fostering economic development at an international level.

Good practice tip:

The role of the partners goes well beyond funding and they are considered by all three members of FABLABIA to be key strategic elements in the business model. They should contribute to building the community of stakeholders but also developing innovative and distinctive activities on site and fulfilling the vision and mission on a daily basis.

The FabLab should also aim at acquiring its own specific partners. Obvious targets are machine and material suppliers. Both brigk and FabLab Brno have been successful in setting up agreements with such market players, securing preferred rates and highly discounted prices for their purchases of consumables and equipment. FabLab Brno, for instance, has a privileged relationship with Prusa Research and is otherwise typically getting a 20% to 50% margin on the purchase of consumables for the FabLab from various suppliers. Technoport couldn’t leverage such networks in its regional environment but secured an agreement with some leasing financial institutions to fund the acquisition of the machines. Research facilities in the field of 3D printing

and industrial designers could also be successfully attracted to the innovation centre and contribute to further training FabLab staff. In terms of technical partners, companies making equipment or active in such fields, such as Arduino, are highly relevant in terms of contributions to the activities of the FabLab as they can both buy and offer workshops at the facility.

If the business innovation centres are considered a key driver in terms of bringing business clients to the FabLab, the FabLab in contrast is playing a key role in diversifying external partners interested in working with the business innovation centres. In terms of visibility, this is a mutually beneficial relationship. Both organisations have a strong and common interest in establishing links with corporations, though the decision-making process may be a bit long from their side. It is recommended that the organisation with the longer-term vision and the strongest financial stability (i.e. typically the business innovation centre) be considered the entry point for partnerships with corporations, the FabLab being an add-on to the bench of collaborative activities discussed and implemented.

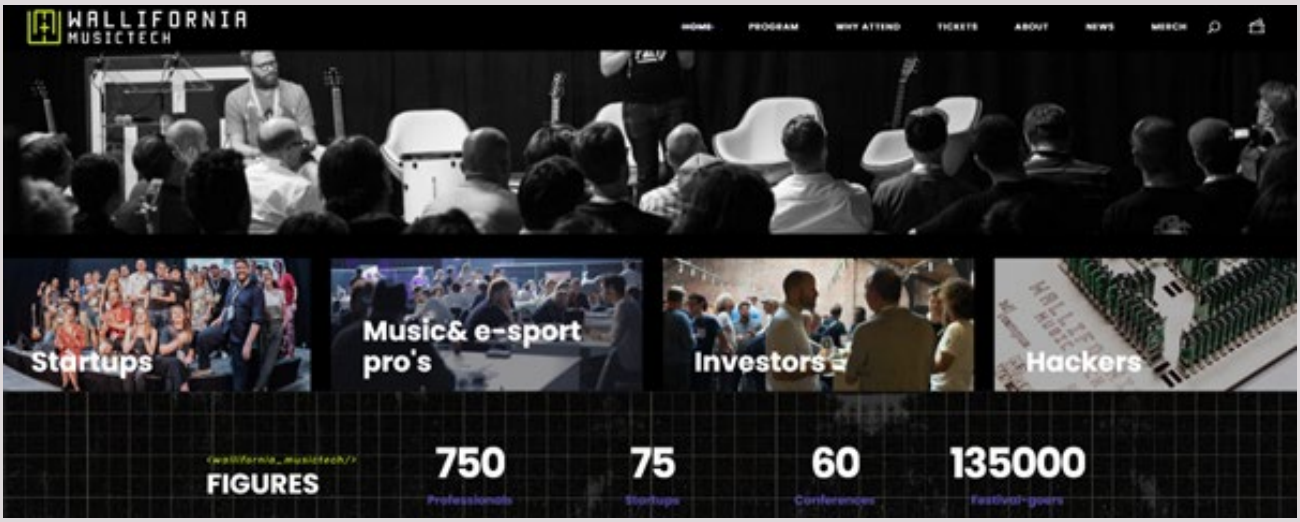
Costs and revenue streams

Special attention should be paid to the legal structure of the FabLab as it will greatly influence costs and revenue streams. As a private organisation, having Technoport as a mother organisation has actually been detrimental to its FabLab in terms of benefiting from public subsidies, being integrated into educational programmes at schools, and being part of projects funded by NGOs. From the experience of all members of FABLABIA, it's also much easier to get sponsors as an association than as a private organisation, the corporate funds dedicated to sponsorships being typically oriented towards the non-commercial sector. A non-profit legal status is highly recommended

for FabLabs, if not the legal status of the business innovation centre, as making the FabLab sustainable without public support is a considerable challenge.

Wallifornia

The event is a cross-border music tech and e-sports festival that brings together 135,000 people, including startups and hackers. It was a great event for Technoport to expand the services of the FabLab to new vertical sectors. 3D modelling and 3D printing services were successfully offered to music- and sports-related innovative companies for the purposes of making prototypes and hardware devices. Those industries typically require design skills which are not part of their core expertise and they have proved to be a very relevant target for FabLab Luxembourg.



It is also difficult to directly invoice the added value of the FabLab in terms of learning paths and knowledge experience to the beneficiaries and that part of the budget is ideally covered by a public entity in charge of promoting skill-building and technical education at the regional level. This is the case at FabLab Brno, which was successful in acquiring a substantial budget for educational purposes from regional authorities. On top of providing feedback to the FabLab financial partners on the revenues generated and the costs incurred, FabLabs should ideally identify and offer activity indicators that will be relevant for their financial stakeholders and support their reporting to their own funding institution, whether it is a ministry, a city, or a private entity. The activities should be heavily defined so as to make the FabLab sustainable, bringing sufficient revenue to cover costs, but beyond the financial balance, it is recommended to think in terms of added value brought to the innovation ecosystem as a whole: which community of entrepreneurs was served by having their needs resolved? Which one has been supported and developed for the future?

In terms of revenue from end users, Technoport initially worked on a project-oriented basis and invoiced companies for the services they used at the FabLab (materials bought and hours spent), but this model had some drawbacks: companies typically wanted to set the price in advance and underestimated the hours needed for the project; moreover, the project management and the responsibility for the outcomes of the project tended to fall on the shoulders of the FabLab, which played the role of a full-service provider. That not only prevented the FabLab from fully fulfilling its mission in terms of education, but also reduced the capacity of the FabLab to empower end users and develop the local ecosystem. brigk and FabLab Brno both have always used a subscription-based model, with different pricing for individuals, students, small companies, and larger corporations. Access to

the machines and limited support are included in the subscription, which is an incentive for active engagement from members and repeat visits to the FabLab. This is the typical and recommended standard revenue model for FabLabs which has been adopted by FabLab Luxembourg, too, after testing customised invoicing depending on the specific machinery used, which proved quite complex and too costly to manage.

In order to foster the stability of the members, which is key in terms of customer retention but also building long-term links within the community, a discount can be offered for yearly subscriptions. This model allows for better financial projections and is considered suitable if the FabLab can attract and accommodate a large enough critical mass of end users and has the capacity to retain them. Since the prices for subscriptions cannot be set too high, however, it is recommended to limit the support and involvement of the staff in the framework of this model, to mitigate expectations and restrain the users from requesting access to on-demand prototyping as part of their subscription. JIC aims at limiting the free support offered to users during each range of 6 hours allocated to beginners to a maximum of 30 minutes. Technoport has the same practice, additional individual support being charged depending on the type of activities involved: between 45€ and 90€/hour for CAD developments, between 30€ and 60€/hour for CAM operations, and between 15€ and 30€ for generic project supervision.

Different levels of memberships are a common practice which is considered a must-have in order to acquire and retain a diverse community of members. The pricing should be adapted to the financial means and willingness to pay of the target stakeholders. Similar to what is being done at business incubators, the pricing structure may take into account the size of the customer (e.g. number of employees) or the revenue generated, though that criteria may be difficult to track for the FabLab, given the diversity of target stakeholders. As a minimum, a distinction can be made between categories of end users, most commonly students, individuals, non-profit organisations, and small and large companies. At Technoport, a special discounted price is offered to startups hosted at the technology or creative business incubators of the organisation and therefore already making use of the business development services of the business innovation centre too.

Additional services can be charged on top of access and use of the machinery at the FabLab and are worth considering as additional revenue streams. If the FabLab can include a co-working space, this option is considered

a good one to attract and retain on-site makers. This solution has been successfully implemented by Technoport and brigk and allowed them to justify a higher subscription fee through a package offer.

Another best practice from brigk is setting up a large storage space where end users of the FabLab can store their materials and prototypes. A fee is being charged for this service, which allows the FabLab to profit from some space not suitable for the installation and use of machinery. Further ideas to consider in a FabLab include a shop where some products can be sold or a place to get food and drinks which can be either managed by the FabLab itself or be sub-rented to a service provider.

In terms of facilities, Technoport had the FabLab built on the premises of its business incubator, which is considered an asset for boosting the use of the FabLab by hosted entrepreneurs. The FabLab can, however, be in a separate building, located relatively far from the business innovation centre. This is the situation at brigk, where makers are therefore offered a range of side services on top of the machines, including a permanent desk or even private office space for specific projects or daily work purposes. On top of a physical facility, FabLab Brno has a creative business model which includes a mobile FabLab installed in a truck. This option is very suitable for business innovation centres located in rural areas or willing to target communities spread all over the region. A sponsor can be called upon to buy the truck, which in the case of FabLab Brno was the regional public authority, but some European structural funds can also be considered. This can induce a high budget for the FabLab, however, which in the case of FabLab Brno is estimated to be 240,000€ per year.

Apart from physical facilities and when a partner can be found for providing the infrastructure (as is the case at Technoport), the main costs for the FabLab are related to human resources. The team is typically small which compels organizers to think deeply about the most relevant profiles by mapping the external skills available in the innovation ecosystem and leveraging the resources of the business innovation centre. Being associated with a business incubator is a key asset for FabLabs in terms of having access to business, project management, financial management, and accounting profiles. A best practice from brigk for limiting HR costs is to build a strong group of volunteers by leveraging its community of general makers. A factor in the success of their FabLab is the commitment of their community members. This is a key specificity and asset in the FabLab model in general, compared to other support structures.

Training and workshops are typically sold at cost and offer only a small margin for additional profit, especially if some external experts have to be hired and paid. They can be sustainable, however, if they are sponsored by corporations. Event sponsorship is considered the most suitable funding mechanism for this specific target group. Other financial agreements are harder to negotiate since the FabLab does not fit very well into the budget of corporations, such as marketing campaigns or equipment rental.

Good practice tip:

Though FabLab should aim at being sustainable, the main value is not in the revenue generated, but on the human, knowledge, and business development side. The value of the services offered should, however, be acknowledged by end users and partners who should be aware of the gain. FabLab Brno thus indicates in its brochure the price of the machinery available at the FabLab, the internal expertise offered as well as the results achieved, in line with those of the business innovation centre (fusing vision into real products and creating a commodity on which a business can be built). In terms of revenue, it is highly recommended to be creative and leverage the resources available to the business innovation centre whether local or international, public or private.

The team at the FabLab can consider offering occasional consultancy services. The staff at FabLab Brno has thus advised and supported other organisations in setting up their own FabLab and were paid for the support and consultancy work provided. Technoport included the FabLab in the services offered by the business incubator to external organisations, such as bootcamps, ideation, and acceleration programmes offered to corporations, as well as business workshops and hackathons organised for companies and students. One day at the FabLab can typically be included in the budget foreseen for organising such events, which are part of the core business of most business innovation centres. In this context, the FabLab can moreover be considered for the provision of follow-up services to the most successful projects and teams. A practical example is Act in Space, a challenge organised by Technoport and aimed at using patents, technologies, and data available from CNES, ESA, and Airbus to create business perspectives into non-space related sectors. The successful teams can benefit not only from the incubation programmes of Technoport but also the robotics expertise of the FabLab in order to further develop their business idea.

Last but not least, FabLabs can provide valuable expertise in the context of European projects run by business innovation centres. FabLab Luxembourg was thus involved as a partner with the national business innovation centre in an Interreg project called PROUD, in which designers engaged with consumers or end users involved in the development of new products or services for value creation.

Inspiration from Innovation agencies: Sprintweek — rapid prototyping for companies

The so-called sprintweek is a B2B event offered by brigk to companies. The concept is close to the Google Design Sprint from Google Venture. Google had so many ideas and suggestions for great products and they wanted to figure out the best one in a short manner of time, without spending too much or too little time on an idea. The sprintweek is a structured way to give the interested company a perfect basis to decide if an idea should be continued or postponed.

The process takes one whole week. Each day has a certain function and motto in the process. Starting with Monday, where the goal is to really understand the idea and challenge. Each day there is a set of suggested methods which can and should be used. But the most powerful tool is the clock. Having smaller sessions timeboxed really keeps the pressure high for the participants. After having made a final decision and prepared a storyboard, the whole Thursday is for prototyping. The rapid prototype is mostly not about proving a certain technology — instead it should fulfil all the minimum requirements so that a person who is supposed to use or buy the product can really give feedback or use the product in the intended way. On Friday, a group of experts will test and feedback the rapid prototype.

brigk adapted the concept to take a challenge from a company who wants their idea to be proven. brigk scouts external experts new to the topic and forms an interdisciplinary team with heterogeneous skills. For example, if the topic is related to sustainability, then the team should have an expert in this field as well as a designer and a business model expert. The experts can be from startups or big corporations outside the incubator network. The experts get paid and take a vacation from their daily job to really focus 5 weekdays fully on the given topic.

In 2019, we managed to run this programme three times. All companies are in the field of mobility technologies (NDAs prevent us from naming them). In total, one week costs around 25,000 EUR.

In the beginning of Covid-19, we adapted the sprintweek structure to a one week hackathon which we organized totally digital. Each day at 10am, the participants received an introduction of the earlier mentioned five mottos. They received guidance throughout the whole week and a structured ruling and support.

What do SMEs want out of a FabLab?

In the previous chapters, we elaborated in more detail on the benefits of cooperation between business incubation centres and FabLabs. But what do SMEs themselves desire from a relationship with a FabLab? To adapt services to the needs of SMEs, we created a short survey. In this survey, we asked 110 SMEs (clients of JIC, Technoport and brigk) about their prototyping needs, what would motivate them to use a FabLab and what additional services it should have. Moreover, the purpose of the survey was to find a way to increase the added value of FabLab for companies — clients of the innovation centre as well as support of the BIC´s services through an influx of talents from FabLab.

The survey had two phases — in the first one we designed several open questions and interviewed 28 SMEs. The goal of this first phase was to precisely design the questions and obtain feedback from our clients we are in regular contact with. This first phase helped us to develop the final survey.

Lessons learned

Prototyping in a FabLab as a service for SMEs in innovation centres was provided in Technoport FabLab. Although this service was very popular, it comes with its own set of challenges. It is important to strictly communicate this service as prototyping, not manufacturing! The Technoport experience also shows it is difficult to make this service profitable.

The **main findings from the survey** showed us that SMEs:

- would prefer to use FabLab as an on-demand service. They would like to order a complete prototype solution rather than going through all steps like requirements and analysis; quick design; choosing the right technologies and building the prototype.
- want more and bigger machines (solution for the whole PCB prototyping, metal 3D printers, CNC for metal materials, water jet cutting, coating; machines for cutting and bending metals)
- prefer nonstop access to the facility.
- want very specific expertise — they would appreciate specialists they can hire for limited time: material experts, CAD+CAM professionals, skilled operators but also soft backgrounds like UX designers.
- require a combination of business workshops which would be part of FabLab activities.
- need support not only in prototyping but also in product validation and later commercialization.

To meet the expectations of SMEs, combine the expertise of BICs with facility in FabLab, and propose sustainable economically feasible solutions, the following recommendations were made:

Target	Proposed Solution	Examples
Enhancing and communicating possibilities of FabLab in terms of business	**Use cases of using FabLab for SME**	Examples of benefits of cost savings for SMEs Examples of benefits of speed prototyping Examples of benefits of making something that was thought impossible Examples of making products just a little bit (or a lot) better Examples of marketing stuff that they can make
	Success stories of SMEs using FabLab	Real stories of companies who used or are using FabLab
	Individual approach	Doing startup events just to bring startups/ SMEs to the FabLab so they can see Guide for SMEs – make it clear that they are welcome and you expect them to come Specific welcome procedures for an SME joining the community Active online/offline and word of mouth communication of the above Offer special education for them Offer special hours for them (staff assistance) Have a (co)working space at FabLab for businesses Look for problems (challenges) they have and try to solve them e.g. with hackathons
	Make it part of Key Account Managers' (KAMs) strategy	KAMs have a good knowledge of success stories, use cases and in the best-case scenario of the FabLab itself KAMs actively open the topic of prototyping and production
	Business workshops and speeches designed for FabLab users	Don't focus just on technologies, make business workshops or speeches etc. There are some examples: Price setting for products, phases of product cycle (from prototype to validating a prototype, from validation to product, from product to mass production), industrial design, design thinking, materials, patents...

Target	Proposed Solution	Examples
Solve companies' problem with lack of expertise	**Matching platform for SME and makers**	Makers that want to participate can list their skills, such as product design, software knowledge, hardware knowledge etc. and companies in need can reach out to them This relationship is between the SMEs and makers, FabLab only administers the platform and occasionally requests feedback from the parties using it.
	Internal/external network of experts or workshops	Not just a platform like above, but FabLab guarantees the skills and experience of experts. They are usually more expensive than makers. You can use these experts for speeches or workshops so people know them and trust them Organizing workshops or training on most requested expertise.
	Help them find the expertise online	Make online courses or point to external courses or videos that people can take advantage of.
Solving companies' problem with lack of hi-tech machines	**Buy it or borrow directly**	Find out the real (!) demand. Do the math – consider cost of operation and investments, revenue... Find out if you can borrow it somewhere and then decide.
	Network of suppliers and manufactures for SMEs	Some manufacturers focus only on mass production. SMEs are usually only interested in small-scale, but it is difficult to find these manufacturers. Looking for them is a worthwhile endeavor FabLab can negotiate bonuses and discounts for SMEs that use the services of suppliers or manufacturers SMEs that have special technology can provide it to the network too with the right specialist
	Find a workaround using a different machine	They might not need a new machine they want, help them find the desired outcome with the machines that are accessible
	Find sponsors	Sponsors can provide machines for free, at a discount, or they can buy it for the FabLab directly

Conclusion

This design option paper summarizes the experiences of 3 innovation centres that are connected to FabLabs and hundreds of SMEs. Technoport, the brigk Makerspace, and FabLab Brno have shared their know-how primarily as part of offline workshops at each of their premises but also online via conferences and digital communication between 06/2019 and 11/2020. The needs and experience of SMEs was gathered via survey — in the first phase via offline interviews with 27 SMEs and based on those interviews, an online survey was prepared which 83 SMEs took part in.

To summarize the previous 47 pages, there are three key findings:

FabLabs can play an important role in supporting SMEs in rapid prototyping — cooperation with business innovation centres is crucial.

Examples of successful companies that have benefited from FabLab services can be found in the dedicated chapter. Our ambition is to show innovation centers and their clients the importance of prototyping, which FabLabs are ideal for. Moreover, makers using a FabLab can benefit from business support provided by the innovation agency. As the success stories show, cooperation between FabLabs and innovation centres resulted in successful technology companies with annual turnovers reaching into the millions of EUR.

Innovation centres cooperating with FabLabs remove the barriers between students, makers, and entrepreneurs.

A FabLab naturally resonates with university students (especially architects and engineers) and serves as a meeting point for makers with various backgrounds, while the innovation centre is a natural place for entrepreneurs and SMEs. Putting these groups together creates unlimited potential not just in terms of prototyping or mutual cooperation but also in the form of inspiration for all groups. The benefits of FabLabs need to be clearly formulated and communicated to each group of users.

FabLab is relevant for SMEs

Based on our survey, SMEs have three main issues in terms of using FabLab for their business:

- They don‘t know about the possibilities
- They don‘t have an expertise with the machines
- They need other high tech machines that are not involved in FabLab.

The first issue can be solved by offering use cases of cost savings, speed prototyping, real examples of successful companies. An individual approach to each group is also crucial.

The second issue can be addressed by creating a matchmaking platform between makers with specific skills and entrepreneurs who need those skills, providing internal or external expertise in various fields or helping them to find the expertise online.

The third issue can be solved by buying or borrowing needed machinery, finding workarounds on available machines, finding sponsors, or creating a network of suppliers and manufacturers specifically for SMEs.

FabLabs in general are becoming more important as interdisciplinary research and development facilities. Therefore, FabLabs can support the innovation centres in achieving their objectives and strengthening innovation and the entrepreneurial ecosystem in a designated region. As our experience shows, cooperation between FabLabs and innovation centres helps increase the visibility and potential of both digital fabrication as well as entrepreneurship and serves as an efficient tool for increasing regional competitiveness.

Fablabia
2020

FAB BRNO

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brigk