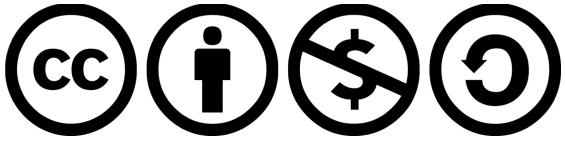
DT.1.4.2 BARCELONA FABLAB

Report from Barcelona FabLab Study visit — Version 1

Meta Štular, Marco Fellin, Marek Rozehnal et al. — 06 2018



1. Visit outline

Date: May 15th 2018

Venue and Host Partner:

FabLab Barcelona , Spain. Tour guided by Matias Verderau and Marco Sanalitro.

Green FabLab, Valldaura, Spain. Tour guided by Jonathan Minchin.

Partners attending the visit:

LP (Marco Fellin, Giambattista Toller)

PP3 (Peter Varga, Adam Lipecz),

PP5 (David Paloušek, David Škaroupka),

PP6 (Patrycja Węgrzyn, Paulina Daczkowska)

PP7 (François Friderich, Meta Štular, Tanja Gawish, Jerneja Batič)

PP8 (Hana Kubánová, Jozef Vaško),

PP9 (Roberto Vdović, Zrinka Valetić),

PP10 (Vincent Zenkner)

Program of the visit:

10:30 Visit of the FabLab Barcelona.

11:15 Questions and Answers session. Deepening on the FLN topics.

12:00 Visit and lunch in LEKA.

13:45 Transfer to Valldaura - Cerdanyola del Vallès (accompanied by FabBCN).

14:30 Visit to the Green FabLab.

17:15 Transfer to the town.

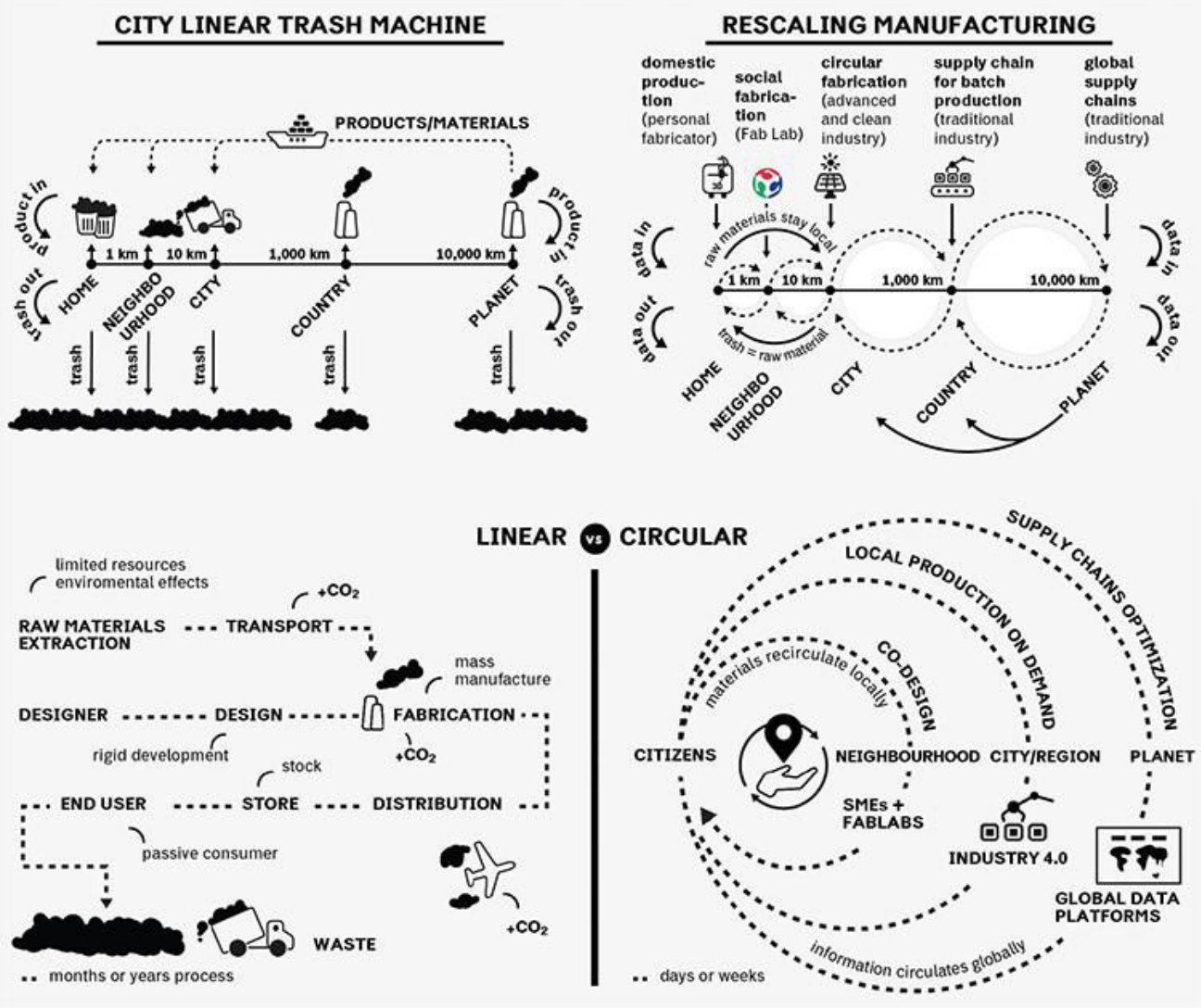
17:45 Arrival to FabLab Barcelona.

The FabLabNet group visiting FabLab Barcelona

FabLab Barcelona description

Fab Lab Barcelona (FLB) is part of the Institute for Advanced Architecture of Catalonia, where it supports different educational and research programs related to the multiple aspects of human habitat. It is also the headquarters of the global coordination of the Fab Academy program in collaboration with the Fab Foundation and the MIT's Center for Bits and Atoms; the Fab Academy is a distributed platform of education and research in which each Fab Labs operates as a classroom and the planet as the campus of the largest University under construction in the world, where students learn about the principles, applications and implications of digital manufacturing technology. It is one of the oldest FabLabs, founded at 2007 and directed by Tomas Diez.
The Fab Lab Barcelona has produced projects such as Hyper habitat IAAC (official selection for the Venice Biennale XXI) or the Fab Lab House (Audience Award in the first Solar Decathlon Europe in Madrid).
It is currently developing projects in different fields, from smart devices for data collection by individuals (Smart Citizen innovative project award in the Smart City Expo and World Congress in Barcelona), the development of the new generation of Fab Labs in the Green Fab Lab project, to new production models for cities with the Fab City project being implemented in Barcelona.

The mission of FLB is to provide access to tools, to knowledge and to financial resources to educate, innovate and invent. All this by using technology and digital fabrication which allow anyone to make (almost) anything and thereby creating opportunities to improve lives and livelihoods around the world.
Community organizations, educational institutions and non-profit organisations are their primary beneficiaries[1].



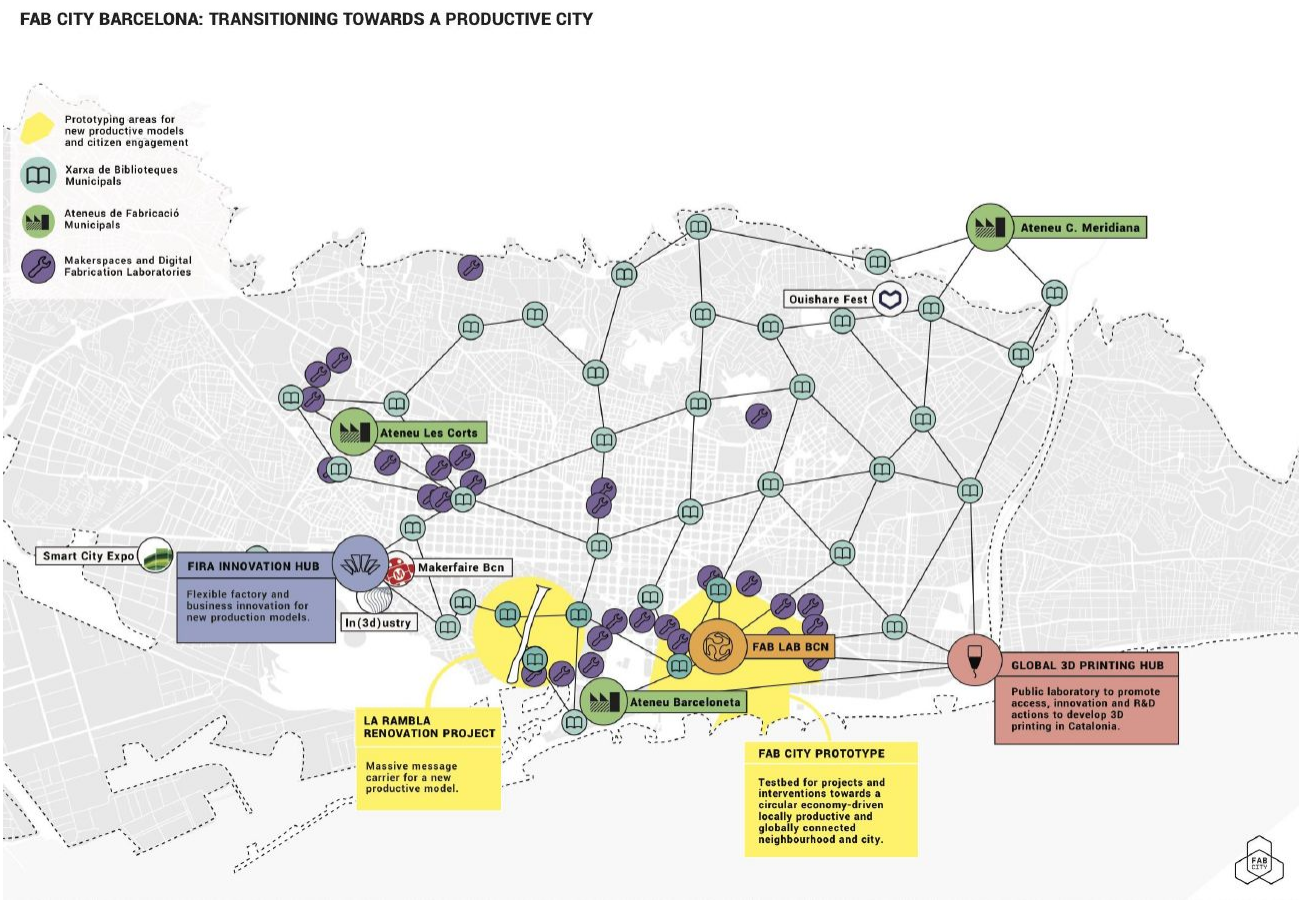
the FabCity concept (Image courtesy of FabLab BCN).

[1] Text written by FabLAb Barcelona, and published in https://fablabbcn.org .

2. Lessons learnt

FLB is located in Poblenou, former industrial neighbourhood under constant refurbishment works, which is now Barcelona's Maker District. The neighbourhood is lively and well populated for the extensive presence of both residents and offices. In the surroundings are also the IAAC, other institutes and laboratories which makes the FLB's location strategic.
The FLB has strong connections with the local network of laboratories belonging to a wide variety of local Makerspaces and Digital Fabrication Laboratories (as represented in the following image).
The FLB involves local communities by proposing various activities, such as the weekly open lecture, workshops for children from 8 years on, music, art, open shows, presentations. However, they do not offer classical fablab programme such as trainings or open hours for citizens. Those activities are offered by smaller neighborhood makerspaces and fablabs.

The main hall of FabLab BCN (Poblenou)



FabLab Barcelona and its local network: the FabCity (Image courtesy of FLB).

Key factor for the involvement of the communities can be summarized in two mottos:

- *Solve real life problems*: Involving communities in solving everyday-life problems means giving them the opportunity to put in practice what they learn with a precise and useful goal.
- *Involve communities in problem solving*: It's crucial to allow participants to experience what they are learning, by giving them the opportunity to experiment in real situations and make errors. E.g. do not teach them how to solder, but give them a solder iron and assist them while doing the first testing.

Other important community building principles can be:

- *Be open*: Creativity is a great potential. No matter how an idea is bizarre, it's always worth considering it.
- *Listen to the people*: Co-create with the participants, integrate their suggestions and ideas.
- *Give them power*: Attributing responsibilities is a great way of making durable relationship, and of having satisfactions at the end of a process.

- *Valorise diversity*: We are an heterogeneous group of people, each with his or her own background, education, story, capacities. This is an extremely valuable pool of potential resources to be used to make our outputs legendary!

2.1. Management and Organization

The group visiting both, FLB and Green Lab, found them interesting and inspiring.
FLB performs their activity in a 1000 m^2 space, well organized in several labs (textiles/fashion, robotics, wood, learning, 3D printing, laser cutting etc.). This allows them to gather experts in several fields to guarantee expertise and quality.
FLB runs up to 9 European projects at a time. Their core knowledge in architecture and design, being part of the Institute of Advanced Architecture of Catalonia, allows them to be an added value as a partner in many projects. The key factor for being able to get involved in several EU funded projects seems to be the fact that FLB is part of a bigger institution (sharing human resources, having financial flow, etc.) which allows it to produce ambitious programs.
The FLB crew is very professionals and science-oriented, they almost work like "real" scientists, experimenting and creating. FLB is very interesting in terms of being a part of an innovative ecosystem of the city. It is a relevant stakeholder for innovation, well connected to the city and the university.
Its infrastructure and resources made of people, ideas, projects, spaces and tools are a flexible environment wherecity and community problems can be addressed in an innovative way.mart citizen project represents a great result of such a creative environment.
They try as much as they can to not become a service lab, because in the long run it will turn a place into a regular commercial service. This is something very frequent in other FabLabs, many of them struggling with economic difficulties and accepting whatever income source is possible.
Green Lab in Valldaura offers a new field of sustainable development with focus on biolab and green development. It's a great example of self-sustainability.
Green Lab was considered by the majority of partners as the highlight of this visit. It seems the key factor of its success is the vision and the commitment of the University which bought the house an 6 hectares of surrounding land in order to tackle the global issue of green development and sustainability. We could observe again that sustainability of a fablab rises incredibly if it is part of a bigger institution. Those external conditions connected to the high level commitment of local staff seems to be a recipe for success.

Inside the FabLab Barcelona: on the left the laboratories rooms, on the right the conference space.

The FabLabNet group visiting the FL. Tour guided by Marco Sanalitro.

The robotic arm equipped with various home-made accessories

The FabLabNet group inside the FabLab Barcelona during the visit

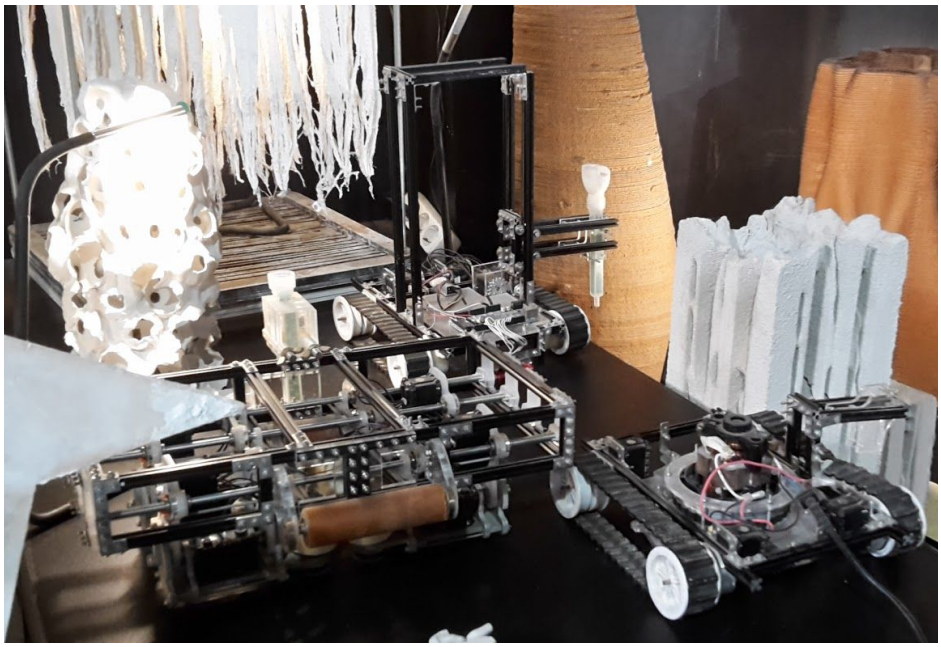
The Smart Citizen - Urban sensor board developed by FabLab Barcelona

The Green Lab in Valldaura - inside the FabLab room.

Thanks to its very innovative projects and a great manager, it's isolated location does not impede visitors from all over the world who want to make their projects there or learn from Green lab experience.
The two labs are both inspiring for the FabLabNet partners and members, and can be considered for establishing projects seen for our wider community on national level.

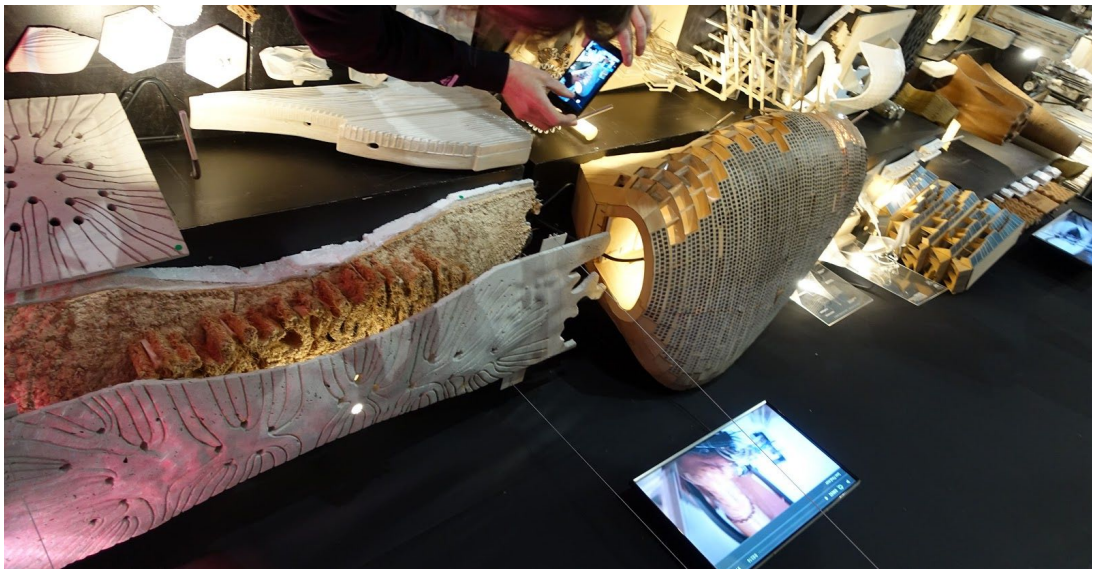
2.2. Tools and equipment, technical aspects

Apart from the standard FabLab equipment, the FLB has some impressive capabilities.
Generally, the laboratories are well separated from each other, thus allowing a restricted access and limiting the interferences among projects (but limiting also the valuable occasional suggestions from other members). The spaces and machines do not strictly follow the safety normatives and law, allowing a quick and prompt hacking/improvement of the machines, a deep understanding of the functioning. This freedom has the price of a higher probability of incurring injuries.
They have developed robots for 3D printing with various materials, especially targeting architecture. Those systems rely on robot capable of moving vertically for constructing models of buildings, and also on a standard robot arm (Kuka) equipped with a clay extruder.
The printing of soft materials on a standard FDA 3D printer seems very promising. This technology allows realizing decoration of wearable textiles. It can be also used for testing complicated surgeries by printing realistic 3D models of human organs. These rubber organs can be realized as exact copies of the patient's organs, by acquiring the model with medical tomography, which is then modeled and printed in 3D environment.
The textile laboratory, and its integration with the 3D printed soft plastics is something pretty new and gave a deep inspiration to many of the visitors.
The Green Lab has developed very interesting low cost robots for improving robotic benefits to agriculture.
The vast outdoor available spaces, together with the hosting capabilities that makes possible residential seminars are a great potential for this lab.
This FLB presents very well the ongoing and past projects by exhibition panels all across the main FLB room. This is a very efficient way for demonstrating the lab capabilities, stimulating future projects and raising questions during tours.

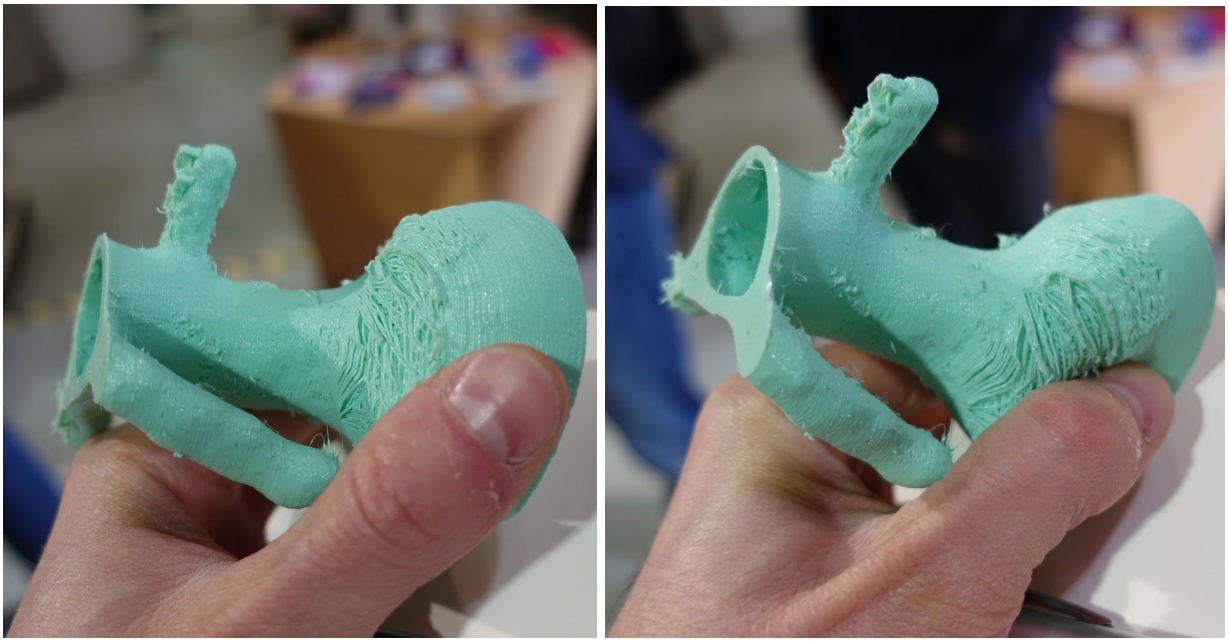


The house-building robots. They work with clay or other extrudable materials.

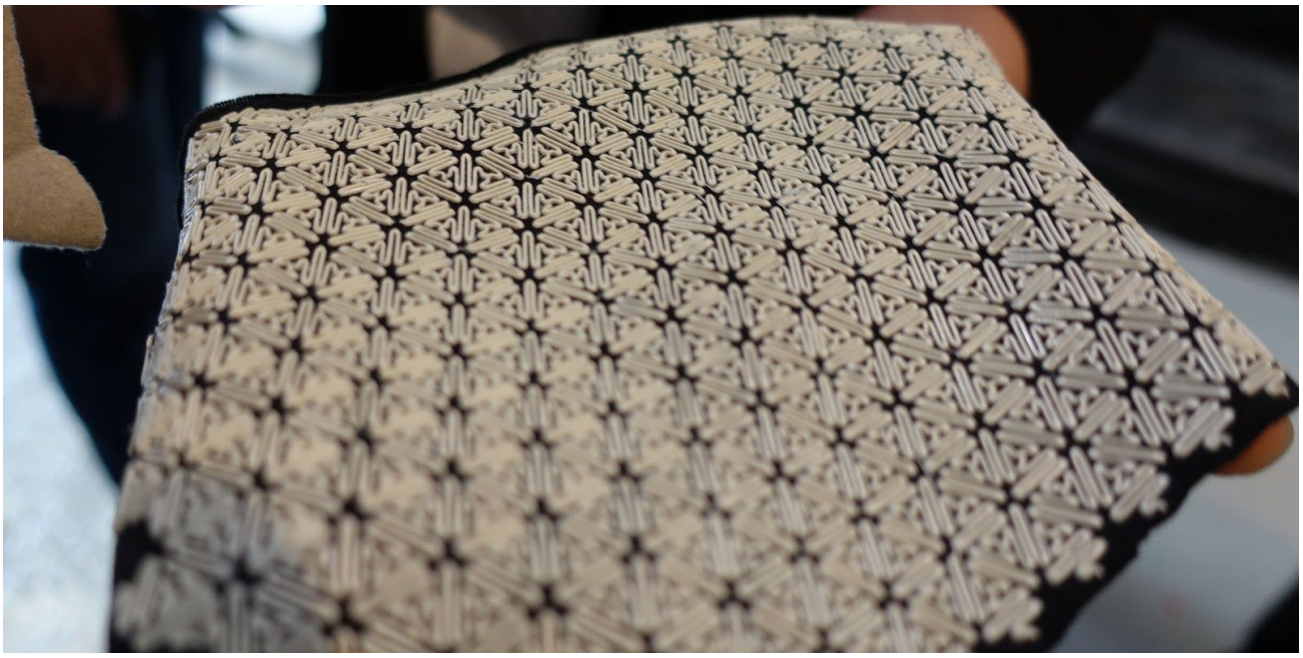
Some of the model-houses constructed with the robots above.



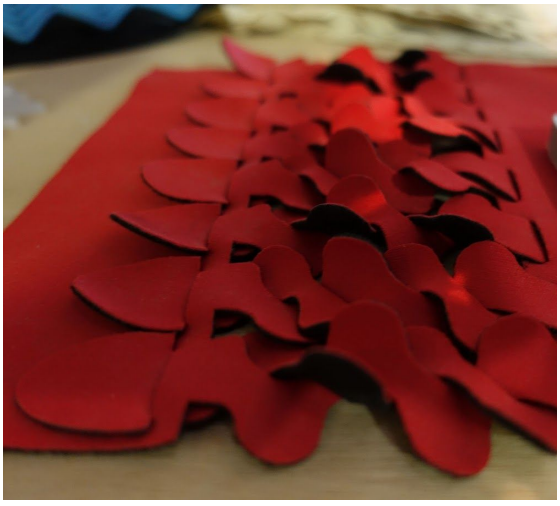
Some of the prototypes in the exhibition. FLB being part of the Architecture faculty is evident.

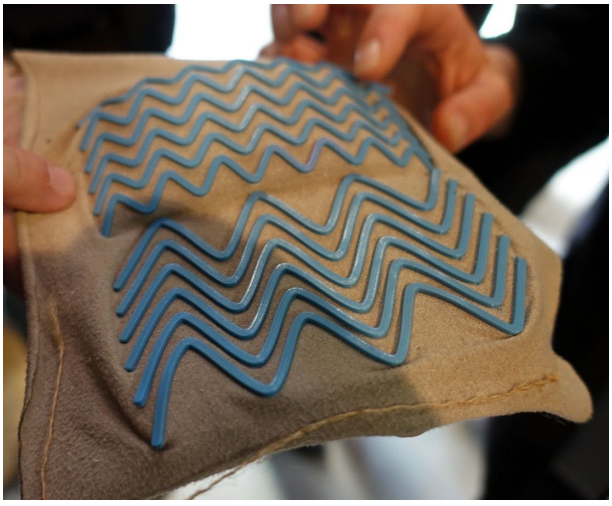


3D printed models of human organs. The soft-consistency helps surgeons to practice.



Soft materials printed directly on fabric. They open new possibilities in the field of textile design.



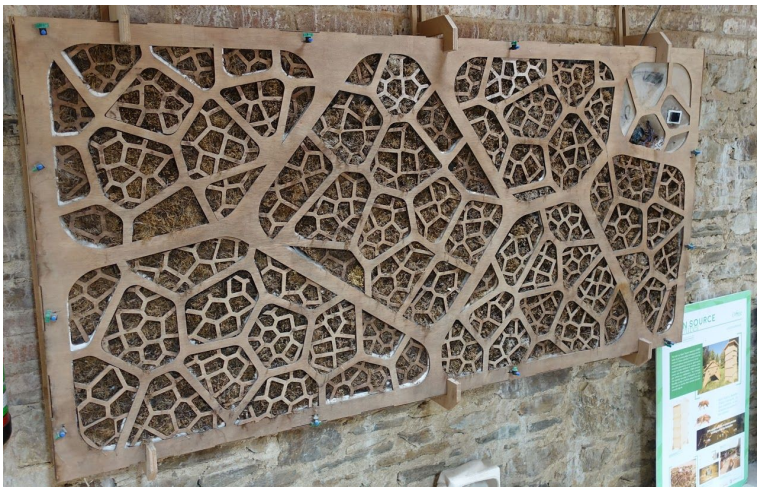


Other examples of innovation in textile design. Use of laser cutting (left) and 3D printing (right).

One of the laboratories in FLB (milling machines). They are all in a separate room.

The Green Lab location: a vast forest and land surrounds the lab (white building in center-right), just above the city of Barcelona (in the background). Image © Google.

Inside the Green Lab in Valldaura. Fungi-based architectures (left) and one of the panels presenting ongoing and past projects which surround the main FabLab room.



The bio-photovoltaic system is moss and bacteria based. One panel provides about 0,5 V and few mA.

2.3. Economics

The major income comes from EU projects, which are currently 9 with 20 persons involved. This ensures financial stability.
The FLB takes advantage of being a part of an university for the participation to these projects, since this allows pre-financing and reduction of some fixed costs (administration...). Also regarding the Green Lab this partnership is a key factor, since their own existence was possible only because of the purchase of the building and the 6 hectares of surrounding forest by the university.
The members of the FLB, which are in other FLs the major source of income, do not play a major role in the case of FLB, since the majority of them belongs to the university which provides free access to the facility.
However, courses taught outside the traditional universitarian curricula, like the FabAcademy, are to be paid, so they represent a source of income for the FLB.
There are other projects that the FLB running with private partners, such as R&D projects for SME and design workshops with companies such as IKEA.
Other sources of income are the renting of the Green Lab for events, workshops or residence seminaries.
The FLN partners were surprised, at the very beginning, of the fact that the guided tour of the FLN and Green Lab was not for free. This is however an example of limiting the money exits and covering the expenses of the facility.

2.4. Community

Involvement of the community based on problem-solving.
The FLB has actively involved the local community in the process of prototyping the solutions to everyday community problems. We were shown a case study of the invention of an online monitoring system for measuring and sharing audio levels of a noisy square in Gracia neighborhood.
Smart Citizen project which grown from sensor based electronic gadget to community engagement tool is something interesting for national level because community building is an issue in different situations. The experience they conducted with their local community was very interesting. They organized several round tables / workshops with the inhabitants of Barcelona, whose aim was to found out in which way can a fablab help the local community. Each participant was requested to explain the major issue they are facing in their daily life in the city. Noise appeared to be one of the main issues. FabLab Barcelona developed an electronic sensor-based device called Smartcitizen, that allows, among other data, to measure and store the level of noise in the area. 14 families, living around the same noisy place in Barcelona, accepted to install the device in their home and at their windows. The data, collected on a period of time and compiled into a central server, allowed the inhabitants of this problematic area to engage a dialogue with the City and with the community responsible for the noise.
We loved the way they've built community with the Smart Citizen project. This project could be an inspiration for development of similar community initiatives in FLN network as well as the exemplary cooperation between FLB and Barcelona city officials.An important element of success of the Smart Citizen project was also strong communication activity which attracted the citizens to the project.
The partners have also observed the diversity of the activities offered by FLB which attract diverse audiences and partners to the FLB. The diversification of fields of interest could be a viable way to diversify audiences in FLN network members.
The visit of the Green Lab was a highlight of this visit. The FLN partners were impressed by the commitment of the local staff and the involvement of local and international communities to resolve various issues related to ecology and self-sustainability, thanks to new technologies and to a transdisciplinary approach. Again, being a part of an university with important financial resources has played an important role in being able to purchase the building with the 6 ha of surrounding forest.
Besides involving local communities it was quite impressive how Iaac and FLB are able to build an international network of partners focusing on similar projects.

Team of experts in several fields to guarantee expertise and quality.[2]

[2] Source: https://fablabbcn.org/about_us.html

3. Mutual benefit and challenges

The great examples listed above could be a reason enough for visiting FLB but amongst all things seen and learnt, there's also a really important factor which is inspiration. Seeing such a great example of what we could all be motivates us to work even harder on our goals. For project purposes,the way that FLB interconnects with other FabLabs, communities, EU and national officials is an outstanding example of building a network/community that all the members benefit from, and also provides a vision of how our own FLN network could be sustainable after the end of the EU project. It is always good to learn from more experienced colleagues. What we have learned is that a FabLab can be more sustainable if it is a part of a bigger institution such a s an university and with EU funding.The academic environment offers important support – both in terms of human resources and ideas as well as in terms of financing - especially if a FabLab wishes to participate in consortiums of EU financed projects.
For many FLN partners the visit in Barcelona was an inspiring experience. Some of them are considering to start similar community engagement projects and to establish closer collaboration with municipalities regarding different city challenges and the ways of solving them. For the FLN project purpose, it was also crucial to establish personal contacts which could lead to new transnational collaborations. It is important to build a network of fablabs which are able to share best-practises, successful projects and models as well identifying areas of collaboration which could be important in the future.

4. Transferability and sustainability

The first challenge of transferring best practices would be local context. Local governments in CE are not yet aware of the important role that fablabs can play in the society and how they can offer an accessible way to enter the world of digital technologies to different communities. By learning from the example of the FLB, the FLN can first transfer the good practices of rising awareness on national levels.
The way they network and some of the projects they run are all interesting and inspiring, and all could be replicable in other environments. The two greatest barriers we see are money and time - we've seen that it can be economically sustainable, but it really isn't easy, and about time, I think now the greatest barrier is that our hands are full with responsibilities coming from the FLN project deliverables and administration.
However, the model of the FLB took long time to become sustainable, therefore an important barrier in transferring good practices could be time. If not supported by important human and financial ressources years can pass before such transferred good practices can show concrete

results in the society. I think there is need to support more activities with excellency potential and care more about ways how those projects can grows into business.
Of course we would like to implement the lessons learned from the visit. In our case the most important is the way of community building.
The way that FLB has engaged their local community to empower the citizens with help of the knowledge developed in a FabLab is an interesting approach that could be applied in other FabLabs. Another lesson learned is that FLN members could shift from services to the members to more conceptualized and complex development projects. A realistic goal could be to work more closely with private companies on ideation projects.

5. Inspirations for the future of the FabLabNet as CE Network of FabLabs

Important part of activities in FLB are result of collaborations and networking. This is great example of how wider community can benefit of collaboration within a network of organizations. We can expect the same from the CE Network, which might have socio economic impact on national levels but also on the whole region. Seeing an outstandingly working model has helped us to rethink new opportunities and possibilities of FabLabNet further development and leadership.
The experience of the FLB shows that the most important way to be economically sustainable is to have interesting and relevant programs. The investors and potential partners are not interested in machines but in innovation and creation potential.
Simple programs such as trainings are not interesting enough content for an international collaboration. They are completely rooted in local needs of everyday users who rarely need an international context for basic steps in development of their prototypes. The idea of FabLabNet partnership offering a High Level Training as an international programme might be, from this perspective, questionable. There is no evidence that individual makers would travel to another city to get the same training they can get at home. We can use some help of audience development theory which builds its methodology not just on “willingness to pay“ for certain product or service but also on “willingness to travel”. In other words, we should ask ourselves how many kilometers would a person from Ljubljana or Trento do for a training.
Given the FLB experience it might be more reasonable to build an international cooperation by mobilizing diverse expertise of fablabs and makers in order to address common challenges such as transport, aging, food production, noise pollution, etc. This kind of cooperation could have a form of short term and long term prototyping workshops and might be more interesting for participants since it would give them a sense of purpose, the opportunity to exchange values and knowledge and to meet other professionals in concrete co-working environments.
Another model that we have seen at FLB is the program of international internships which is also feasible if a fablab has something more to offer than mere technical trainings. The programs of

internships or a job shadowing programme would be interesting for FabLabNet, since they would offer the possibility to widen the network and to involve fresh and innovative young minds in local fablabs.
The FLN also needs to be more visible. In order to become a sustainable CE network the FabLabNet partnership should first set more ambitious goals, serving the society and local communities in a meaningful way by empowering them to solve different burning problems. As all the members of the FLN are experts in prototyping, we should create concrete examples with high communication potential to show what we can offer to different communities as a network. In this sense we have to think beyond technology and use our fablabs for what they offer - crossroads of arts, design, engineering, education, technology, humanities and sciences. We should work on on common objectives, which are measurable and communicable, across different regions.
As we could see in FabLab Barcelona – making connections between different stakeholders is very important. In case of CE FabLab Network the partners are also connected to different communities, institutions and companies, which makes an added value to the project. What might be missing are more projects that would connect those stakeholders in a meaningful way, inspiring common projects and good communication tools which would attract other fablabs to join us. Some partners already have common projects with FabLab Barcelona. This visit will definitely help FabLabNet to be a bridge between the future members and the most active FabLab in Europe.

6. Conclusion

Visiting the first EU FabLab and also one of the first self sustainable labs was an inspiration for future activities of individual members and the FLN network.
Thanks to the thoughtful organisation by the lead partner, the FLN consortium had a really inspiring visit with many insights which can be used in further development of the CE network.
The most important lesson from the visit is that the FLN has first to articulate the values behind the transnational network, than we should rethink how we wish to communicate those values and at the end we should decide what kind of activities we can offer to communities in order to support the core values.

The FabLabNet group visiting the Green Lab in Valldaura.