

The challenges of managing a Fablab in a developing country: the Philippines

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Abstract

This paper discusses the challenges encountered by a Fablab in a developing country as well as the approaches taken to address these challenges at 'Fablab UP Cebu'. The three major challenges identified are: finding funding; organising procurement; and, promoting a maker culture.

Fablab UP Cebu is funded by public funds, grants and user contribution. The current funding model relies on generating enough research, industry and community output to create positive visibility to support the continuous application for grants.

Procurement of equipment and material supplies is dictated by strict and complex government regulation as well as limited local supplies of specialised equipment. We are taking steps to reduce friction in the procurement process as well as exploring using an alternative legal entity to simplify the acquisition of some of the Fablab needs.

Finally, the Fablab values defy many established local cultural and societal norms. The concept of 'out-of-the-box' thinking is difficult to promote in a culture traditionally dominated by micromanagement and risk aversion. Furthermore, Fablab's collaborative exchange and learning opposes the typical teacher-student model. To enable gradual shifts in norms, we encourage users to operate the machines themselves, run workshops to create a multidisciplinary maker community, and organise events like makeathons.

Keywords

Fablab management, Fablab governance, Fablab funding, Fablab culture, developing country

1 Introduction

Hundred of Fablabs are being created annually and many of these are now appearing in developing countries. But as these new labs are opening, they face challenges specific to their environment and context including limited resources, limited supplies and established cultural norms.

This paper will discuss the real-life challenges encountered by a Fablab in a developing country as well as the approaches and steps taken to face these issues in our practical experience at 'Fablab UP Cebu'. This Fablab opened in June 2016 at the Cebu campus of the University of the Philippines (UP). We will discuss how local circumstances including regulations, level of industry development, limited specialised supplies and local cultural norms are the main influencers to these three major challenges: finding funding sources;

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organising procurement; and, promoting a maker culture. Each section in the paper will also detail the steps taken to mitigate or overcome these challenges at Fablab UP Cebu.

2 Fablab funding

Running a Fablab requires significant resources including floor space, equipment and its maintenance, people power, consumables and utilities. Multiple funding models of cash or in-kind funding are being used by Fablabs and makerspaces around the world. Table 1 summarises the main known and used funding possibilities. Most Fablab and makerspaces combine multiple funding methods.

Funding model	Summary description
User funded	Users pay for service, pay for education or pay a membership fee.
Complementary business	A complementary side business such as stocking parts and material to be sold to makers is used to generate income for the lab.
Private sponsorship	Private organisation(s) sponsor the Fablab with in-kind lending or donations. Private lab opening to the public.
Public sponsorship	Government agencies, such as a university, fund the Fablab for the public good; usually for the purpose of education, startup incubation or promotion of technology.
Grant funded	The Fablab runs like a regular research centre by applying for and receiving public or private grants.
Charity	Private benefactors donate small or large amounts to help run the Fablab.

Table 4: Summary of existing Fablab funding models

2.1 User funded

In this model, Fablab or makerspace users pay for using the facilities. This relationship can take many forms:

- ‘Pay-for-service’: users provide specifications of a part to be made and the staff design and build the part without the customer interacting with the Fablab equipment.
- ‘Pay-for-use’: users pay for using the Fablab machine(s). Fablab Bohol [1], the first Fablab opened in the Philippines, like most other Filipino Fablabs uses this model. The commercial company Techshop in the USA, which aimed at creating a profitable makerspace model, failed and filed for bankruptcy in early 2018 [2].
- ‘Pay-for-education’: users pay to attend workshops or complete a course leading to formal qualifications. Examples of this model include school students coming for a puzzle-making class, running a technical workshop, community members attending the Fabacademy etc. Most Fablab and makerspaces organise such events to generate income as well as attracting new users.
- Membership: users pay a regular membership fee (e.g., daily, monthly, yearly) to access the facility and the equipment. ‘Robots and Dinosaurs’ [3], a makerspace in Sydney, Australia, provides a typical example of a subscription model where makers to pay a daily, monthly or yearly fee in exchange for access to the space.

2.2 Complementary business

In this model, a side business is setup to generate income for the Fablab. Such examples include:

- Stocking and selling parts and materials that are conveniently available to makers for their projects.
- Setting up a cafe selling refreshment and food to Fablab users
- Renting part of the premises for event or workshops organised by third parties.

2.3 Private sponsorship

Some makerspaces use direct private sponsorship in the form of cash for publicity (often when organising large events) or in-kind such as free machines, machine lending, material or workshops. Sparklab [4] is a example of a privately sponsored makerspace, where machines are provided by a local equipment seller who uses the lab as a demonstration area.

In other forms of arrangements, some private companies open their labs and machines to the community at specific times. One such example is Snepo [5], a private company in Sydney, Australia, that opens its Fablab to the public 3 days a week for free; in exchange, users are requested to volunteer for the lab from time to time.

2.4 Public sponsorship

This model is by far the most common funding used by Fablabs in the Philippines and probably around the world. Many Fablabs reside in an educational institution, who provide the space and have been set up using some sort of public funding by local or national government agencies.

Government agencies use the Fablab for education, startup incubation and/or promotion of technology. Fablab UP Cebu and Fablab Bohol, for example, have been set up by their local Department of Trade and Industry office and are hosted inside state universities.

2.5 Grant funded

This is the model used by many university research laboratories around the world, where researchers apply for available grants to fund their research and operations. Such grants can be sourced from either public, private or joint private-public partnerships. Fablabs in universities are thus well positioned to use this strategy; for example, Fablab UP Cebu successfully received grants from the Filipino Department of Science and Technology (DOST).

2.6 Charity

Like any other organisation benefiting society, some Fablabs ask and receive cash and in-kind donation from generous benefactors. Some Fablabs put in place a donation box, others are donated old equipment or parts. In some countries, this approach can be more successful if the cash donation can be made tax deductible. As a general rule, a charity system does not collect much and is unlikely to support any significant share of the cost of running a Fablab.

2.7 Funding Fablab UP Cebu

Fablab UP Cebu started by receiving public grants and funding and its space is provided by the University of the Philippines, at the Cebu campus. The token amount charged to users for machine usage can only cover a small part of the real cost of running the Fablab before becoming prohibitively expensive to the local community. Hence, Fablab UP Cebu is already using a combination of public sponsorship and user-funded models.

As the University of the Philippines does not have enough resources to continuously fund the Fablab, alternative funding models were explored. The complementary business model has proven difficult to put in place at Fablab UP because of the restrictions and constraints associated with being hosted inside a state university: the large amount of overhead, process and regulation involved in managing a complementary business was forecasted to be higher than the additional income that could be generated.

In the first few years of operations, the Fablab ran successful large community events and professional conferences, helped numerous small and medium enterprises to learn about digital fabrication technologies as well as building prototypes. Using its reputation capital, Fablab UP Cebu is now applying for further public grants to sustain its operations. Therefore, at present Fablab UP Cebu has to continuously maintain its reputation and prestige and showcase its usefulness and relevance to the university, students, makers, industry and the greater community in general.

3 Fablab procurement

Access to tools, parts, consumables and materials is a core necessity to all Fablabs that need to acquire and maintain digital fabrication equipment. Fablabs also need access to the components and materials required for its users to develop and build projects and prototypes.

Even with the required funding available, Fablab UP Cebu has difficulties acquiring the necessary machines, tools, parts, consumables and materials for its operations. This situation has resulted in multiple extended equipment downtimes and severely limited the capabilities of the Fablab to provide services to industry and to the community. Table 2 lists the equipment outages faced by Fablab UP Cebu in 2017, where the difficulties in procurement have caused or aggravated all of these issues.

The main challenges for procurement that Fablab UP Cebu faces are:

- Highly complex procurement processes caused by anti-corruption regulations in government entities.
- Limited suppliers, local availability, choice and quality of specialised technologies.
- Unreliability of information and absence of online catalogues, searching and browsing capabilities with local suppliers.
- Difficult to import: procurement regulations prevent government entities to easily buy from overseas suppliers.

<i>Equipment</i>	<i>Duration</i>	<i>Scope</i>
Laser cutter	3 months	Worn out laser tube limited laser machine to engraving or cardboard cutting only.
Laser cutter	3 months	Broken extraction fan.
Desktop CNC	11 months	Inability to replace the broken 3mm collet prevented use of the desktop CNC with a large range of end-mills including PCB milling.
Desktop CNC	24 months	Inability to use a 1/8 inch (3.175mm) milling tools. Still unresolved.
Large CNC	6 months	Difficulties organising suitable local suppliers for 1/4 inch milling tools. No collet for 3,4 and 6mm tools.
Oscilloscope	10 months	Difficulties finding suitable local providers delayed the commissioning of this system.
Conferencing system	5 months	Difficulties finding suitable local providers delayed the commissioning of this system.
Vinyl cutter	6 months	Blunt cutting tool inside these machines has not been replaced leading to lower quality cuts.
Print and cut	6 months	Blunt cutting tool inside these machines has not been replaced leading to lower quality cuts.

Table 2: List the main equipment outages faced by Fablab UP Cebu in 2017.

Under these circumstances, staff spend large amounts of time on the bureaucratic processes while the lab runs with limited supplies, and machines have been out of action because of missing replacement parts. This is a challenge shared with most other Fablabs in the Philippines but also in other developing countries.

3.1 Complex procurement processes

Fablab UP Cebu, like most Fablabs in the Philippines is hosted in state university that is a Filipino government organisation. All government organisations in the Philippines are required to follow a complex set of rules when spending public (e.g., taxpayer) money. Whereas spending rules exist in all government entities around the world, the constraints applied in the Philippines as a results of anti-corruption regulations, organisation culture and internal politics create a challenging work environment.

Whereas, all the different units of the university involved in procuring equipment understand and have experience in acquiring office consumables e.g., pens, paper and toner cartridges. However, the process becomes much harder when dealing with equipment where the name, function and use is completely unknown to the office workers and the chain of managers who are required to sign off every step of the process e.g., yearly spending plan, budgets, request orders, canvassing (tender) processes, procurement order etc.

The main challenges applying to procurement at the University of the Philippines include:

- Business can only be done with companies locally registered with the Securities and Exchange Commission and other relevant local authorities.
- Above a specific expected cost (approximately 40 000 PHP or around 750 USD equivalent), all procurement requests have to go through the Philippine Government Electronic Procurement System (PhilGEPS).
- Below that amount, canvassing has to be done and at least three valid competitiveness quotes have to be gathered.
- Specification of equipment must be detailed and cannot contain the brand name.

Whereas other laboratories in the university need to follow these rules, exemptions to this complex process can apply for specific equipment dedicated to research use. Unfortunately, this exemption does not apply to Fablab equipment, where usage is not dedicated to research only.

The way specifications must be written for the procurement request limits the ability to have interdependent specifications between items. As a real example: it is near impossible to specify a metal pipe with an outside diameter in a range of 300 to 400mm and a matching heatband of the same diameter, as the pipe supplier may provide us with a 400mm pipe and the electrical equipment supplier may give a 300mm heatband that will not fit. This limitation forces Fablab staff to spend large amounts of time checking what is truly available with each supplier that is, traveling to the supplier premises and checking the stocked items to determine how to write the equipment specifications. Such artificial restrictions on specifications also reduce the potential market competition, leading to higher procurement costs.

3.2 Limited local availability

Even in Cebu city, the second largest city in the Philippines after the Manila / Quezon city megalopolis, access to specific technologies can be very limited. Even if available, specialised parts are usually overpriced compared to the international market and rarely stocked, therefore needing to be ordered and shipped.

Here is a non exhaustive list of items that we had issues finding locally in 2017-18: 3D printer 2.85mm filament, 3D printer extruder, 3030 aluminium beams, GT3 belts and pulleys, CO2 laser tubes, laser cutter mirrors, laser cutter focusing lens, ER25 collets, end mills with the correct shank size for the CNC milling machines, high quality plywood, precision electronic equipment, bulk electronic components, arduinos / raspberry pi boards and modules.

Furthermore, for any equipment requiring the use of PhilGEPS, only suppliers registered to the system (which takes time and is not free) can bid. Many businesses cannot or refuse to supply to government

entities because of the bureaucratic complexities involved, again restricting the effective market competition and increasing procurement delay and cost.

3.3 Unreliability of information

Unreliability of information and absence of online catalogues, searching and browsing capabilities with local suppliers is a major issue, especially when combined with the limitations on procurement specifications. At the time of writing, no local providers had an up-to-date online (large) catalogue. While checking for specific parts or components via phone calls is sometimes possible, nothing replaces making the trip to the shop, having a conversation with the seller, seeing the available items and working out what will and will not work.

Even after the following these processes, many issues still arise due the the length and complexity of the paperwork chain where every step is prone to human error.

3.4 Difficulty to import

As discussed above, the regular government procurement process does not allow for business with entities not registered with local authorities. Therefore, in practice, importing overseas equipment and supplies requires finding a locally registered importer, which takes longer and costs more than it would to directly deal with international seller.

Even as an individual or non-government entity, international shipping and customs (import) fees can be problematic, although a recent policy change has made it easier to import items to the Philippines with a value (including shipping) of up to 10 000 PHP or equivalent to \$185 USD.

In conclusion, Fablab UP Cebu, like most if not all public Fablabs in the Philippines, has difficulties procuring its equipment and supplies. These difficulties directly translate into a significant loss of Fablab output because of machine downtime, lack of parts, lack of flexibility etc.. Furthermore, the large amount of overhead required by the staff to manage the procurement process means that the time spent on these efforts displaces contributing to concrete Fablab output and projects.

Significant steps have been taken to address the procurement challenges at Fablab UP Cebu. First, the staff are working at improving the efficiency of the process: creating a good awareness of the proper procedures and making sure that there is a good mutual understanding across the different university services. Second, since users pay for machine usage, not all of the Fablab funding is public. This situation could allow for the creation of a new legal entity in the form of a cooperative or foundation, for example, that could collect and manage generated income. Such legal entities would be significantly more flexible and efficient at acquiring specific equipment than the current government procurement process.

4 Fablab culture

The first two challenges, funding and procurement, are very objective resource management problems, the topic of creating and sustaining a successful local Fablab culture is much more subtle. In this section, we will share our subjective real-life experience in promoting the Fablab values at Fablab UP Cebu, taking into account many established local norms. We will discuss the following topics:

- Moving away from the 'make shop' transactional model to a do-it-yourself (and learn) approach.
- Teaching the Fablab's values: 'anyone can make almost anything' idea and challenging the traditional hierarchical and specialisation culture. Promoting 'graceful failure' and 'out-of-the-box' thinking in a society where micromanagement and risk aversion is the norm.
- Encouraging Fablab's collaborative exchange and learning paradigm to a community with traditional teaching methods in schools and universities.

4.1 Moving away from the 'make shop' model

Unless they have been in a Fablab before, most first-time visitors at Fablab UP Cebu expect the Fablab to work like a 'make shop': ask for a service, provide the raw material if necessary, wait for the job to be

done, then take the finished work and pay. In fact, this is how the lab ran for a few months after its opening as this was the default transactional business approach that people knew.

Therefore, apart from the curious who wanted to try the machines for themselves and the workshops teaching how to use the equipment, most users were not learning anything about actual digital fabrication. As a result, and despite Cebu city's potentials, no real maker community settled in the Fablab during that time.

To address this issue, Fablab UP Cebu changed its policy to enforce that staff would not run the machines for users anymore. Instead, first timers coming with a job would receive an immediate induction to the Fablab's rules and an introduction on how to safely use the machine needed. In addition to providing the materials, users would also be requested to take the material offcuts back with them and clean the workspace/s used.

While the initial machine demonstrations cost some staff time, it was found that this investment quickly paid off as returning users required a lot less help to complete their jobs. Also, the amount of required cleaning was also significantly reduced.

To regain the users who disengaged the Fablab because they did not want to operate the machine themselves, our next step was to offer the make shop model with a twist: trying to match these users with local maker/s who are willing to run the job for the final user for a fee.

4.2 Teaching the Fablab's values

In the context of the Philippines as a developing nation, people perceive digital fabrication machines as highly expensive and assume that only specially qualified professionals have the competence and authority to use them. Even when being given a chance to operate them for themselves, most people would honestly, and wrongly so, believe that the Fablab machines would be too complicated for them to handle. Furthermore, and although this was not one of Fablab UP Cebu policies, some other Fablabs in the Philippines use project approval paperwork in order to control machine usage. One can assume that such discouraging processes were perhaps put in place by the management to protect the valuable assets of the Fablab from misuse and damage.

Therefore the traditional hierarchical, specialisation and risk-averse culture present in both the potential users and the management of the Fablab is a real barrier to the Do-It-Yourself (DIY) value the Fablab seeks to promote.

In addition to forcing users to operate the fabrication machines themselves, Fablab UP Cebu created a weekly workshop called 'Think Make Break' to promote the creation of a community of makers beyond students and academics to include industry professionals from different backgrounds. Diversity and industry is a very important aspect of a maker community as it promotes practical and critical thinking, inspiration and idea generation.

The workshop was designed with the constraints of the local Cebu community in mind:

- A suitable weekday evening was selected to allow for full-time professional workers to join and avoid the weekends (which are culturally dedicated to family and other community commitments).
- Light food and drinks are provided to encourage attendance, this is a very important to the success of the workshop in the Filipino context.
- In a place where many things are unreliable, the workshop was consistently run every week, no exception.
- The event was advertised on the main social media platform used in the community, along with a theme, a couple of days in advance. Advertising a week ahead was found not to be as effective.
- At the beginning of each workshop, attendees and staff introduce themselves and wear a nametag to encourage conversations as well as a safe and inclusive environment for anyone to talk and ask questions.
- Sessions are run as interactive discussions between the presenters and attendees.
- Everyone is welcome to present any ideas, projects or experience, even in an impromptu manner.

- To promote multi disciplinary projects, a variety of inclusive topics were discussed including plastic recycling, screen printing, jewelry making, electrical safety and basic electronics.

‘Think Make Break’ became a great and effective way to attract new users in the Fablab and grow these users into makers. The workshops kept a large emphasis on motivating, breaking down cultural, self-efficacy, access barriers and empowering people. The three main messages Fablab UP Cebu promotes to the community are:

- **Anyone can make:** everyone can learn how to use a digital fabrication machine to make projects. There is no need to be a technician or an engineer to operate the equipment. We have worked with nurses, designers, artists and entrepreneurs to encourage the maker mindset.
- **Failure is part of the learning process:** the choices are not binary failure or success, but rather action or inaction. Action may lead to either failure or success whereas inaction brings no change. Failing fast, limiting the consequences of failures (such as avoiding burning the lab down) and learning from failures is paramount to the making process. However, this message is very counter-intuitive to people who grew-up and live in a risk averse culture such as the Philippines.
- **Sharing ideas is better than hiding them:** an idea without an implementation is less actionable than discussing ideas with others to help filter out or grow weaker ideas into viability and potentially helps to find ways to implement the viable ideas.

4.3 Collaborative exchange and learning

After multiple ‘Think Make Break’ sessions, we found a solid base of individuals highly interested in the Precious Plastic initiative from Dave Hakkens [6]. After finding some funding, Fablab UP Cebu organised the Precious Plastic Cebu Cooperative Makeathon in December 2017. During the event, over 30 participants worked together in Fablab UP Cebu to build a Filipino version of the four Precious Plastic recycling machines. The event ran over two non-stop 48-hour weekends and welcomed participants from all around the country with different gender, age, profession, and education.

The cooperative makeathon was a great example of the power and effectiveness of collaborative exchange and learning. The event worked as a social equalizer and we witnessed people with no education teaching fabrication to PhD graduates as well as women leading machine design and welding metal frames, which is not the norm with local culture.

It is important to make users feel that once they walk in the Fablab, the rules are different: apart from strict safety protocols, the lab is a free and safe space to think ‘outside of the box’, to try and succeed or fail, share knowledge and create at will, free of judgments, social and gender norms.

Using a strategy of creating regular events and quality workshops as well as fostering large popular projects such as an implementation of the Precious Plastic recycling machines, Fablab UP Cebu is participating in the improvement of the local economy and social fabric.

5 Conclusion

One can acquire machines and space to create a Fablab, but this is not sufficient to successfully host a prosperous maker community. Without the proper governance ensuring continuous funding, efficient procurement of equipment, and promotion of an open maker culture, a Fablab is far less likely to succeed in its mission and survive long-term.

Fablab UP Cebu has taken active steps to identify the greatest challenges faced since launching in June 2016 and is taking action to remedy or mitigate the impact of these issues. In this paper we have shared our process of understanding and addressing these challenges within the context of a developing country and detailing the efforts developed as a response.

Of course, many other challenging aspects of Fablab management have not been discussed here and are left for future work and continued conversation with the Fablab community. For example, some of these topics include safety and safety training, staff management and retention, connection and relevance with the local industry or advertisement, visibility and reputation etc..

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