The business case of FryskLab, Europe's first mobile library FabLab

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Abstract

Purpose – The purpose of this paper is to describe the emergence of the mobile library FabLab FryskLab, a project of Bibliotheekservice Fryslân (BSF). There will be special attention on how the business case has been established.

Design/methodology/approach – The author examines the broader development of (mobile) FabLabs in libraries. Based on the description of sub-projects that together make the project FryskLab the approach of BSF is described.

Findings – The design of a mobile library lab speaks to many people's imagination. However, achieving a sound business case requires a lot more than just driving around in a bus and providing practical workshops. Developing supporting projects is necessary.

Originality/value – At this time most publications on mobile library makerspaces are held in the realm of popular publications (blogs, magazines). Very little has been written on a wider range of case studies where mobile library makerspaces have been integrated into library services. This paper serves as an insight on how BSF developed the FryskLab project.

Keywords Library services, Networking, Librarianship, Education, Library and information networks, Library facilities

Paper type Case study

Introduction

In September 2014 a Dutch documentary titled *Digitaal Geheugenverlies* (*Digital Amnesia*) (VPRO Tegenlicht, 2014a) aired on public television in the Netherlands. The episode featured among others Brewster Kahle, director of the Internet Archive, answering the question if we are paying enough respect to our cultural heritage and our collaborative future by massively closing down libraries and archives. The following week the series featured an episode about the maker movement, *De Nieuwe Makers* (*The New Makers*) (VPRO Tegenlicht, 2014b), focussing on the rise of digital fabrication. In my view the future library lives right between the contents of the two episodes.

The question what role digitization plays in the development of the Library of the Future builds on classic thinking about cultural heritage. How do we preserve? What do we preserve? Who do we preserve for? How long do we preserve? Numerous technical, logistical and ethical answers to these important can be expressed, but these ignore the most important role of the public library: providing access to knowledge and information and facilitating our users to contribute to knowledge production themselves. The result should be a library where users are knowledge makers as well as knowledge consumers.

FabLabs in libraries

Earlier this year David Lankes tweeted: "Libraries are about building knowledge in any, ahem, medium. The communities are the collection, not the books" (Lankes, 2014).

Lankes puts the axe to the roots of what is usually seen as the most important task of libraries: making books available for their users. However, this monopoly of the book

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as the main knowledge vehicle gradually begins to crumble. The internet and online information services are prevalent everywhere and are part of the personal domain of the traditional library user. Libraries themselves are part of this domain too, for instance with the development of ebook platforms.

At the time of writing this paper, I am in Helsinki. Here, of course, I also visited the library and then in particular the library makerspace. This place, *Kaupunkiverstas*, also called Urban Workshop, is an exciting place in the center of town where everyone can go[1]. According to library manager Kari Lämsä *Kaupunkiverstas* emerged as a place where you can see a sharp increase in the number of users. More interesting however is that part of it is also a group of new users. When I visited the place business women with children came together to share experiences. At the same time a young lady was sitting at another spot behind the digital embroidery machine. Lämsä says he never thought before he ever would purchase such a machine for his library.

Kaupunkiverstas serves as an excellent example of the added value a makerspace can have for a library. It comes in a form that you see the most: a big city library decides to include such a facility in its offerings. At the same time however you also see smaller libraries doing so. And finally there is the emergence of mobile library labs. The phenomenon is an exciting example of the opportunities that engage libraries to work on broadening their offerings. And it goes much further than purchasing and showcasing a set of digital fabrication machinery.

Values

According to Nicholas Schiller in his article "Hacker Values ≈ Library Values" hackers and librarians share a number of key values: "We'll see that at least in terms of access to information, public openness, freedom, sharing, and collaboration libraries and hackers are on the same page. There are many things that hackers and libraries can do together that further these shared values and goals" (Schiller, 2012).

In recent years we have seen increasing support of this approach. For instance Barbara Stripling, president of the American Library Association, last year expressed her support for the merger of libraries and makerspaces: "It's enabling libraries to transform their relationship with communities and to empower community members of all ages to be creators of information, not just consumers" (Ghikas, 2014).

This is fully in line with the approach of David Lankes, who is well known as one of the advocates of the philosophy of Library as Platform. In this approach the library should support knowledge creation of its users, and everything (ranging from books to services) has value as long as it is valued by the user. David Weinberger, in addition to Lankes also an advocate of the platform theory, articulates the approach as follows:

> It focuses our attention away from the provisioning of resources to the foment those resources engender. A library as platform would give rise to messy, rich networks of people and ideas, continuously sparked and maintained by the library's resources. A library as platform is more how than where, more hyperlinks than container, more hubbub than hub" (Weinberger, 2012).

The first library-based makerspace, the Fayetteville Free Library FabLab, opened in 2010 in Fayetteville, NY. In this case, FabLab stands for "Fabulous Lab." It was developed by librarian Lauren Britton, who said in a "Library as Incubator" article, in 2012: "Makerspaces are places where people come together to create, collaborate, and share resources and knowledge – an idea and concept that fits perfectly with the mission and vision of public libraries" (Library as Incubator Project, 2012).

A 2013 "Makerspaces in Libraries Survey" (Burke, 2014) by John Burke found that of 109 respondents, 41 percent were already providing provide makerspaces or maker-style activities and programs in their libraries. Another 36 percent had plans underway for makerspace development in the near future (Price, 2013). Over 50 percent of the makerspaces were in public libraries, with most of the rest in academic libraries and a small percentage in public school libraries.

But what are the ways to achieve a sustainable model? Using the mobile library FabLab FryskLab I will be explain how they have approached this.

Project FryskLab

FryskLab is an initiative of Bibliotheekservice Fryslân (BSF) (Library Service Friesland)[2]. Friesland is a rural province in the northern part of the Netherlands and FryskLab, housed in a former library bus, is Europe's first mobile library FabLab. It has a team with a very diverse background, ranging from IT, arts management and library service management. The goal of BSF is to explore how a mobile FabLab contributes to the creative, technical and entrepreneurial skills development of children and young people. In the end the project should contribute to an increase in the innovative capacities of the province as a whole.

The motto of the FryskLab project is not without reason knowledge-making and sharing of the future. The role of the library is that of facilitator, both in terms of physical capabilities (machines, tools, etc.), but also in the development of training and support. The principle here is that we look at FabLabs and makerspaces as the place where physical and digital use and knowledge-sharing converge. After all, users have the obligation to document their projects, after which they become available to others. In this development Dutch public libraries seem to be European frontrunners. Besides BSF also the Zeeland provincial library service Zeeuwse Bibliotheek and the Brabant provincial library service Cubiss and public library CODA Apeldoorn took the initiative to initiate library FabLabs. Currently libraries in Hilversum, Zoetermeer, Leeuwarden and Veenendaal are also working on realizing a library FabLab[3].

The FryskLab project was started in November 2012, after noticing that, especially in the USA, libraries started to see the potential of working together with FabLabs and makerspaces or creating their own. The team at BSF received space and time to see if it could bring this development to the rural province of Fryslân. However this does not imply that financial resources were available from the start. An initial subsidy from the province of Friesland, the primary funding body of BSF, was rejected. The reason given was that the project in their opinion had no link with library services. This could have meant that the project would never have launched. BSF, however, decided that the project team members were able to continue the project on their own initiative. In practice the consequence was that roughly 80 percent of the spent hours came from personal commitment. This obviously led to the conclusion that other sources of funding had to be found. I will get into that in "How to realize a sustainable library FabLab," later on in this paper. First I will explain why BSF decided FryskLab should be a FabLab instead of a makerspace.

FabLab

FryskLab uses the FabLab environment to bring twenty-first century skills to primary and secondary education. With a dedicated educational program the project tries to tackle-specific local challenges. The FabLab, short for Fabrication Laboratory, was started by Neil Gershenfeld at the Center for Bits and Atoms in Massachusetts Institute

of Technology (MIT) Media Lab around 2005. Gershenfeld was inspired by the success of his own MIT course called How to Make (Almost) Anything. FabLabs are intended to be an open, but structured creative community of fabricators, artists, scientists, engineers, educators, students, amateurs, professionals of all ages. Typically operated by nonprofit organizations there are currently 440 FabLabs in 60 countries[4].

Unlike maker and hackerspaces, FabLabs are guided by a Fab Charter that outlines requirements that all FabLabs should have in common. The Fab Charter was created in 2006 that outlines some of the general norms, which are shared by all labs (the idea is that each FabLab subscribes to the Charter and pins it up on the lab's entrance door). These norms are broadly encompassed by the following points:

(1) be regarded as a "community resource" and consequently, open to the public for some of the week;

(2) respect open source ideas;

(3) consider commercial activities as possible activities, as long they are only incubated in the lab and develop further outside of it;

(4) have a common set of tools, capabilities and processes to allow an effortless sharing of projects and people between labs; and

(5) think about yourself to be part of the wider network (Hielscher *et al.*, 2015a).

The FryskLab truck

FryskLab is accommodated in a truck that formerly served as a traditional book mobile. The dimensions of the truck are $10.33 \times 2.55 \times 3.85$ ($L \times W \times H$ in meters) and the truck weighs 13,000 kg. FryskLab is mainly driven by a retired book mobile chauffeur. The FryskLab truck can comfortably host groups of 10-12 adults or 15-20 children/teenagers. If the weather is nice it is also possible to set up an open-air working environment outside of the truck. This has been done numerous times and is always a success. People are attracted by the new technology and playful setting in which they can tinker and experiment. It is also perfectly possible to bring working equipment inside schools or libraries to create an in-house workshop environment. Since the truck has everything on hand it is easy to bring tools and equipment inside.

The mobile FabLab is first of all equipped with digital fabrication tools: 3D printers (Ultimaker Classic, six Ultimaker 2 Go's, Builder and Up Plus) and a 3D scanner, laser cutter, vinyl cutter, 3Doodler pen and assorted hand tools. For designing, documentation and programming purposes we bring ten Macbook Airs and 15 Dell laptops, plus an Apple TV to give presentations with. We use open source computer boards such as MaKey MaKeys and Arduinos and introduce visitors and students to electronics with little Bits kits. Strawbees are used to protope with 3D design using straws (bought cheaply from IKEA) and laser cutted connection parts. We use a wide variety of software including Scratch, Doodle3D, Cura, Repetier, 123Design, Inkscape, Photoshop Elements, Tinkercad, SketchUp Make, Sculptris and Mozilla Webmaker. FryskLab features its own 4G networking router, which makes it possible to connect to the internet almost anywhere. The truck also has a set up battery-packs with which it can run stand-alone for a maximum of four hours. When electricity is available 220 volts is sufficient to power all the necessary machines and lighting and heating.

Aan Kootstra works at BSF as a Digital Domain Specialist, and is the lab manager of FryskLab. "With our mobile lab," he explained, "we want to contribute to the

innovative capacity of the province. Technology will play an increasingly important role in our society. With the democratization of technology machines are becoming more affordable and in affordable range of citizens. Libraries can play a major role in familiarizing citizens with this technology" (Willingham and De Boer, 2015).

At the moment BSF is in talks with a large number of educational institutions (from primary schools to university level) to realize three so-called life-long digital fabrication learning courses based on the aforementioned themes. The result should be a high potential of skilled young talents for local companies which will benefit the local economic development that is lacking in qualified staff. This dedicated local focus is necessary to realize a sustainable (library-related) FabLab. Often we see examples of libraries setting up labs which are little more than a display for 3D printers and related machines. We however think the potential for digital fabrication in relation to libraries is much higher than just that. It is about, quoting David Lankes: "the mission of librarians to improve society through facilitating knowledge creation in their communities" (Lankes, 2015).

That is especially the reason BSF decided to connect to the FabLab community instead of becoming a regular makerspace or medialab. FabLab is a worldwide hub of open design spaces and facilities where you can make (almost) anything. FabLabs connect digital craftsmanship with open source machines for digital fabrication. The underlying open design principles make it possible to easily share and reuse designs and blueprints over the internet. This turns FabLabs into a networked structure for global collaborative design and production, sharing of knowledge and economic growth. In our educational program students learn use how to use these tools for digital fabrication and open design principles to come up with solutions for local issues.

The sharing of knowledge and learning in international FabLabs together occurs in several parts of the network:

(1) as part of the Fab Academy and the FabLab "Gurus" that it creates;

(2) through the Fab Foundation, regional network and local FabLabs' efforts of trying to set up labs across the globe;

(3) through regional and international meetings and networks;

(4) through creating documents and web-portals and establishing organizations that are meant to support the network;

(5) within collaborative projects; and

(6) generally through creating an atmosphere where people are keen to network with each other and share ideas within and across labs (Hielscher *et al.*, 2015b).

Going places

FryskLab received its official FabLab status in 2013 and received quite some attention, also internationally. In April 2014 project manager Jeroen de Boer talked about the project in Roskilde (Danmark) at the library conference *Make of Die!*, organized by Centralbibliothek. Via Skype he presented at Computers in Libraries (*Hack the Library!*). In May 2014 the truck drove to Aarhus (again Danmark) to be part of the Mini Maker Faire and hosting sessions especially for library colleagues. In February 2015 FryskLab went on an European road trip, the MakerTour2015, which led the mobile lab to the OCLC EMEARC Meeting in Florence and back OCLC (2014). During this trip the team visited 12 (library) FabLabs in eight countries. In these FabLabs sessions were put together on the fly to find solutions for the visually impaired. The main goal of

these sessions was to work out a prototype we had designed: an audio poster, powered by an Arduino computer. Our secondary goal during this trip was to convey the idea of the joining of libraries and the maker philosophy (OCLC, 2015).

According to Kootstra "The availability of digital fabrication is changing the role of individuals from consumer to producer, and libraries are well positioned to develop the types of programs that can stimulate that evolution." FryskLab focusses on educational programming developed around local issues like water technology, sustainability and creative craftsmanship, which they combine with digital fabrication technology. Due to the rural nature of Fryslân, a mobile lab was employed to provide greater outreach and access. Besides educational activities the bus is also used to provide access to digital fabrication at festivals, congresses and other public (cultural) events. A number of Dutch libraries hired FryskLab to be present at their branches and show the public what modern libraries also can be like.

In November 2014 the core members of the FryskLab team[5] received a Dutch library innovation award, the BibliotheekInitiatiefPrijs Bibliotheekblad (2014). In the same year the project was also shortlisted for another Dutch innovation award for the information-technology sector, the IVI Award (Informatie Professional, 2014).

How to realize a sustainable library FabLab

By far the biggest challenge of any FabLab or makerspace is to achieve a sustainable business model. What activities ensure that the lab should not be disincorporated after a short time? The general experience is that many labs often quite easily get a starting budget or initial funding, but that it lacks of long-term planning.

Besides project-based funding BSF is working hard on a sustainable business model for FryskLab. To participate in the educational programs schools pay for using educational material. Furthermore BSF is collaborating with (local) companies in so-called challenges: students find solutions for their company-defined problems and try to solve them using open design principles. In the long run we expect companies to finance parts of this program. In return they can expect to find talented young people who are interested and qualified to work for them, motivated by taking part in the FryskLab program. Finding the connection with the already present local economic infrastructure and stimulating bottom-up innovation is our key proposition.

In 2010/2011 John Boeck and Peter Troxler conducted a Fab Business Study which resulted in eight business models for FabLabs (Boeck and Troxler, 2011). According to Troxler, in an interview for the *Fab the Library!* program, options 1-3 are most promising for library makerspaces.

Grant based

This option requires that there always must be manpower to write funding proposals. This requires an understanding of the possibilities and identification of funding and business opportunities. Given the attention that currently exists for maker culture this is a promising way to get financial support. The disadvantage is that many funds do not provide structural operational support. This means that there must be a sequence of activities to make the lab remain active and visible for the general public.

Pointers:

(1) take time to gather knowledge of funding and sponsorship opportunities;

(2) (some) entrepreneurial skills are essential; and

(3) take time to continuously develop project proposals.

Main income stream: public (or private) funding.

Main service provided: solving problems the funding body has allocated money for.

Main advantage: running costs are covered typically for several years.

Main disadvantage: dependent on goals of the funding body which are outside the control of the library.

Embedded in (educational) institutions

The phenomenon of a FabLab within an existing organization is obvious for library makerspaces. In contrast to "independent" laboratories, this has the benefit that staffing is often already provided for: the library has dedicated staff, or has to invest in focussed training to get existing staff up to speed to be able to work in a FabLab setting. Since the budget of labs is mainly spent on the long-term cost for labor costs this means a great advantage. This also goes for the cost of housing. In conjunction with applying for project grants, this is a promising model that offers relatively much rest.

Pointers:

(1) approach employees that are known to be willing to work in the library lab;

(2) you will discover that colleagues from whom you might not expect it are willing and able to contribute; and

(3) make the lab an essential part of business operations and try to find as much support as possible within the organization.

Main income stream: none, but running costs (personnel, housing) are likely covered by the parent institution.

Main service provided: adding to the (core?) activities of parent institution (e.g. education, providing a workshop, enabling certain activities).

Main advantage: if part of core business of parent institution a view to long-term sustainability.

Main disadvantage: institutions and open access are often hard to combine.

Educational activities

Labs in libraries almost always have a strong educational component. Media literacy can, for example be linked perfectly to elements of maker culture. Think of teaching about alternative copyright models (Creative Commons). This model however requires that there is time spent on the development of educational materials. The reimbursement of these costs could come from a project subsidy. Participants in activities are asked for a financial contribution. In addition a lasting relationship with educational institutions can be built.

Pointers:

(1) Think of good ideas for your educational offering that is distinctive from other providers.

(2) Work on a good also lasting cooperation with educational and other (social) partners.

(3) Make use of the fact that schools can make use of the lab facilities. Often educational institutions lack these possibilities.

Depending on the type of library and the desire of the user other choices are obviously possible. Eventually each local situation is critical in determining the best model.

Main income stream: course and workshop fees.

Main service provided: (ideally: officially approved/accredited) educational activities, lead by FabLab instructors.

Main advantage: stable income stream.

Main disadvantage: relatively high barriers for entry into the market (accreditation), dependent on money available for external activities in the education system[6].

All labs that were part of the study indicated their main business model was providing access to infrastructure that users would have no access to otherwise. Most of them also indicated though that giving access to knowledge of the FabLab network and giving access to experts were equally part of their value proposition. Troxler pointed out then that there are two main business models (or value propositions) possible, namely FabLabs providing facilities and FabLabs providing innovation support (Menichinelli, 2012).

FryskLab: projects to achieve a sustainable business model

The importance that Lankes *et al.* assign to the role of the library community is perfectly in line with a far-reaching way of digital knowledge sharing. Actually one that the beyond the digitization of physical media. Libraries manifest themselves as contemporary centers, not only for unlocking cultural heritage, but also as knowledge-producing entities. As said before the FryskLab project team was forced to look into possibilities for other sources of funding. This resulted in the FryskLabLab actually consisting of multiple projects. Common denominator is that each of them contributes to aformentioned notion of Lankes.

Below is a summary of the projects implemented under the FryskLab umbrella and their contribution to the FryskLab business case.

FryskLab Elements

FryskLab uses the FabLab environment to bring twenty-first century skills to primary and secondary education. With a dedicated educational program it tries to tackle-specific local challenges. In Fryslân we are starting to pilot this program, titled *FryskLab Elements*. It is focussing on digital fabrication in relation to water technology, sustainable energy and new craftsmanship: themes that are locally important. For development of this project a grant was awarded by Fonds21.

The program has been developed for upper primary and lower secondary education. Based on the four elements (water, earth, air, fire) children and teenagers acquire knowledge about the elements knowledge while at the same time making acquaintance with the FabLab, the basics of digital fabrication and open design[7].

The educational program consists of four modules (based on the four elements) in which students create a design using concrete assignments, develop a prototype and report the results. Each module is supported by lesson formats and guidance material. For each module two classes are developed: a lesson and a workshop.

FryskLab Elements: lessons

In case of the lessons hand-outs and worksheets were developed, which are intended as tool for the teacher. The hand-outs serve as inspiration and illustration of methods to fill the classes. On the other hand, the hand-outs consist of practical manuals for working with FabLab machines and sample commands that can process teachers in lessons.

Teachers have the freedom to pick out those elements that fit the way they teach or that they deem appropriate for their students. The hand-outs are therefore not forced formats: teachers decide how they organize the lesson.

The worksheets are designed for students to independently (individually or in groups) get started. The paper worksheets are supported by digital video content. The missions are introduced with a video of an expert. In this message, a technique or craft and the assignment are explained. Students can then use this knowledge and the FryskLab facilities to work independently.

FryskLab Elements: workshops

For each FryskLab Elements module a supportive workshop format is developed[8]. The workshop formats consist of a description of the workshop presentation materials, a spreadsheet, communications equipment and guidelines on how to contact the workshop facilitators.

For the workshops the instructable kits are used. These are standardized sets of materials needed to perform-specific tasks. The instructable kits, for example contain electronic components (LEDs, electric motor, circuit board, etc.) or prefabricated parts made of wood or plastic. A base stock of instructable kits will be delivered. In addition, a basic webshop functionality has been developed on which schools can reorder kits.

FryskLab Elements: open product design challenges

In addition to the regular curriculum a format for challenges is developed. This format allows schools to participate in an open product design challenge based on real problems of companies and institutions. The challenges consist of:

(1) an introduction to the issue by the participating company;

(2) explaining the concept of FabLab; and

(3) explaining the concept of open product design and digital fabrication.

After this a hands-on area is created (including the FryskLab truck) where participants to work on the development of prototypes based on product concepts. The challenge is concluded with short presentations for the clients, including the prototypes and developed business models.

Contribution to the FryskLab business case: educational institutions pay a fee for receiving the lessons, workshops and challenges.

Connected learning: MedialiteracyMakers!

A project that is dedicated to the connected learning approach is MediawijzerMakers! (MedialiteracyMakers!). Herefore we are collaborating with the Mozillarian community, a group of librarians and technologists who "explore the intersection between the Mozilla community and the library world" (Nygren, 2014a). For development of this project internal subsidy was awarded by BSF.

In the IFLA paper *The Public Library as a Community Hub for Connected Learning* (April 2014) (Nygren, 2014b) author Åke Nygren (Stockholm Public Library) cites FryskLab as one of the main European examples of a library-as-connected learning environment. At the National Library Congress in Amsterdam (December 2014) Nygren and FryskLab project manager Jeroen de Boer gave a highly acclaimed presentation about the connected learning approach in public libraries. They also set up a pop-up makerspace on the congress floor.

The connected learning movement supports interest-driven, peer-supported and academically oriented learning by promoting the core values of equity, participation and social connection. By connecting formal and informal learning organizations in

production-centered and openly networked activities with a shared purpose, people gain access to learning opportunities beyond school. Libraries serve as perfect community hubs for connected learning. Therefore digital inclusion is the key element of our proposal. Libraries can play a crucial role not only in enhancing digital literacy, but also in creating opportunities that can result in economic benefits for people who participate in library programs.

With MedialiteracyMakers! BSF wants to achieve that media literacy coaches can produce their own offerings using the open source platform of Mozilla Webmaker Mozilla Foundation (2015a). Capturing these skills occurs in both Frisian and Dutch. Besides this important online component it is also required to work together in a physical way. This is achieved by organizing so-called Maker Parties Mozilla Foundation (2015b).

Maker Parties are physical meetings where the lessons from Webmaker are be continued in a hands-on way. This practical approach is a fundamental part of the program that takes place in six Frisian libraries in 2015. During these meetings the media coaches are instructed in the use of Webmaker. These instructions are provided from FryskLab. It is then the intention that media coaches transfer this knowledge to library colleagues and teachers by also organizing Maker Parties.

Contribution to the FryskLab business case: at first a number of Frisian libraries receive the offering for free. This is made possible due to an internal grant from BSF. In other cases receiving parties pay a fee that serves the expenses that are made.

Fab the Library

With the modular package *Fab the Library!* BSF helps other library organizations to set up a library FabLab or makerspace. The modular package came about thanks to financial support from the Dutch Institute for Public Libraries (SIOB). The program is built upon the notion that the inclusion of a makerspace in a library gives new impetus to the library, especially because she is stimulating innovation and (local) economic activity, without abandoning its core library values.

Fab the Library! has a number of objectives, for instance the development of twenty-first century skills for libraries, librarians and visitors. It also stimulates the development of new crafts and craftsmanship, entrepreneurship and creativity and creating chances for young and ambitious people. Additionally it focusses on new ways of sharing knowledge and information and new ways to integrate emerging technologies in library services and making them available to the public. In the end it is valuable relevance for local economies and (new) partners[9].

Fab the Library! consists of three modules:

Module 1. Introduction: FabLab "How to Make Almost Anything" (duration: four hours):

This module introduces library staff to the concept of FabLab, digital fabrication and the principles of open design. On the basis of a number of presentations and interactive demo sessions, participants learn about the history of FabLab and its concept and underlying principles. Going through this module takes between three and four hours. The session includes the following:

(1) Introduction to the phenomenons FabLab and makerspace. Herefore we among others use the animation *Full Printed*[10] and a video interview with Peter Troxler.

(2) Introduction to the shared values of the librarians and makers. The aforementioned article "Hacker Values Values ≈ Library Values" by Nicholas Schiller is taken as a starting point. The philosophy of Library as Platform, as advocated by David Lankes (2012) and David Weinberger, is an important part of this segment.

(3) A glimpse into the maker movement with a selection of documentaries like Maker, FAB10 (YouTube) or *The New Makers* (VPRO Tegenlicht, 2014b), followed by a group discussion about what libraries and makers can learn from each other.

After this workshop, participants will be able to connect the principles of FabLab with the working practices of the library and to enthuse colleagues and to see the benefits of this connection. In addition participants learn how to translate existing FabLab projects into their regular practice. This module can be interesting for a wide range of participants: from librarian to library director.

Module 2. Practice: the machines – 101 course digital fabrication (duration: four hours):

Library staff learns how to use the various machines in the FabLab. The module is limited to the most commonly used machines in a FabLab: the 3D printer, vinyl cutter and laser cutter. Participants first will get an explanation of the machines and its components. They will also get insight into the software that controls the machines. Based on a number of exercises participants will learn how to work with the software and the machines. At the end of the module they will be able to work in a FabLab and know how to independently guide visitors and clients in the use of the facilities.

During this workshop participants will create a visualization of their makerspace. For this purpose they use the method of Empathy Mapping (Piu, 2011). Empathy maps can be used whenever there is a need to immerse yourself in a user's environment.

The results of the empathy mapping session are visualized by making drawings. These drawings are made useful for the 3D printer, vinyl cutter of laser cutter by using 3D or 2D modeling software. The participants also learn how to make use of the valuable online resources for digital models and projects. The final results are digitally fabricated by the workshop participants. These objects are used in a final pitch in which they elaborate on their ideas and conclusions.

This module is most sufficient for librarians who deal with library visitors.

Module 3. Strategy: implementing FabLab (duration: four hours):

Participants will learn about the organizational, business and strategic infrastructure and facilities needed to set up, organize and operate a FabLab. They learn about different business models of FabLabs and design a solid funding/revenue model for their own situation. The module uses different methods and techniques such as "Empathy Mapping" and the "Business Model Canvas."

After completion of this module participants will have an overview of all the conditions and infrastructure necessary for the realization of a FabLab facility in the library. In addition participants get to know each other and will form a network from which joint support, knowledge and, for example bundled procurement of materials and equipment may occur.

This module is developed for directors, board members and other executives.

Contribution to the FryskLab business case: participating libraries pay a fee for receiving the lessons, workshops and challenges.

FryskLab Linked Open Data Knowledge Base

To not only take, bit also give something back to the FabLab community we are developing a Linked Open Data framework and Knowledge Base to make FabLab projects better available for interested users. For development of this project a grant was awarded by the Pica Foundation.

The starting point for this project is the notion that a FabLab as a physical makerspace is always connected to FabLab as an information space, a physical space

where data were contextualized. In this project we co-operate with Dr Peter Troxler (University of Rotterdam) and semantic technologist Roland Cornelissen (MetaMatter). From the library standpoint BSF also works on realizing a truly open platform for knowledge sharing which will be available later for everyone[11]. According to Sherry Lassiter, president of the Fab Foundation at the MIT Center of Bits and Atoms from the MIT FabLab Foundation Newsletter: "It allows the catalogues of FabLab projects to speak to each other via meta-data – a similar approach to how library catalogues are linked up" (De Boer, 2014).

Contribution to the FryskLab business case: the project is made possible thanks to a grant from the Pica Foundation. Since the start of the project other institutions have shown interest, so a follow-up is a possibility.

Research project open education environment vocational education

Creativity is one of the pillars of the educational programs of FryskLab. The idea is that everyone is a designer. Creative craftsmanship therefore is not tied to creative training, but should be seen as a pervasive element in the entire educational offer in Frisian schools. In conjunction with the NHL University (professorship open innovation) it is examined how this approach will be deployed and monitored. Herefore a curriculum will be developed that is put into practice within Friesland College, a school for vocational education. Digital fabrication and twenty-first century skills will play a major role in this offering.

Contribution to the FryskLab business case: for development of this project a grant was awarded by the Creative Industries Fund NL.

Conclusion

Setting up a (mobile) library FabLab is relatively simple. For many libraries the purchase of digital fabrication machinery is a defendable choice. The growing number of library labs serves as an increasing support to do so. The biggest challenge though is the development of a sustainable business model. The FryskLab project shows that setting up multiple sub-projects not only is a conscious choice, but also a necessity. We have learned that only the provision of a mobile lab is insufficient to generate enough income. The purchase of machinery and other accessories could be funded with one-time external funding contributions. Additionally, we could make use of innovation budget available from our own library organization.

We are convinced that product development is the main way to realize a sustainable business model. Within the project FryskLab setting up product development projects could be funded by external grants. We can offer the products (FryskLab Elements, Fab the Library and other programs) to interested parties such as educational institutions and other libraries. In that sense the mobile lab serves as a sign for a wide range of combined services that bring in the financial means to get the project running, also when the development budget has ran out.

Notes

1. Kaupinkiversitas, available at: www.kaupunkiverstas.fi/en/ (accessed May 31, 2015).
2. Available at: http://www.bibliotheekservice-fryslan.nl (accessed May 30).
3. CODA, Zeeuwse Bibliotheek, Leeuwarden and Veenendaal work closely with BSF which, supported by the Dutch Institute for Public Libraries, developed a special module, *Fab the Library!*, to support setting up library makerspaces.

4. For a complete listing of FabLabs, available at: www.fablabs.io (accessed May 31, 2015).
5. Jeroen de Boer, Aan Kootstra and Bertus Douwes, who are all employed at the BSF Kenniscentrum (Knowledge Center) in Leeuwarden, the Netherlands.
6. Since options 4-8 (see below) are less likely to be adopted by libraries please take a look at an elaboration on those on the wiki of FabLab Iceland if you are interested:
   (4) Co-x (co-working, sharing infrastructure, etc.)
   (5) Operating as a prototype shop
   (6) Access fees
   (7) Techno tourism
   (8) Gurus for hire.
7. (a) Wind energy; (b) smart energy; (c) guerilla gardening; (d) clean water.
8. (a) DIY Water Cannon; (b) Wind Monster; (c) DIY thermo-electric lamp; (d) 3D printing with clay.
9. Fab the Library! at the moment only serves Dutch libraries, but the objective is to make it an international program.
10. YouTube, available at: www.youtube.com/watch?v = NiOKDOnJ3VE (accessed May 31, 2015).
11. FryskLab Linked Open Data Knowledge Base, http://fablab.metamatter.nl/

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