

FabLab observations @ Waag Society

The last years I wonder about the buzz around digital fabrication. While studying architecture at the Technical University of Delft (2003-2010), I experimented with this technology to create architectural models. As design and education professional in the cultural field (2010-present) I used this technology in practice. It took me years to learn how to use these tools within my design process. Is this 'new' technology for creative production really appealing to a broader audience than professionals? And what is the role of (art) education in this? To find some answers I decided to visit the nucleus of digital fabrication. I went to a FabLab for the first time. "A Fablab (short for: fabrication laboratory) is a fully equipped fabrication workshop that gives everyone, from small children to entrepreneurs and businesses, the capability to turn their ideas and concepts into reality. The aim is to make almost anything!" (Waag Society). This essay is a reflection on my findings during a day of observations at the FabLab Amsterdam.

The Fablab Amsterdam is hosted by Waag Society, "a non-profit organisation active in the field of social innovation through creative technology" (Waag Society). For the general public the FabLab is open on Thursdays. Everyone can make an appointment to visit the Fablab and use the available equipment. Using the machines is free of charge, people only have to pay for the costs of the materials they use. On other weekdays, the machines can be rented. The purpose of my visit on Thursday the 9th of July, was not to realize an idea using digital fabrication tools. Instead I brought a writing pad, a pen, a bag of M&Ms and three questions: 'What is the atmosphere in the FabLab Amsterdam?', 'Who uses this FabLab and for what?' and 'What is the role of (art) education in this FabLab?'. My plan was to exchange the M&Ms for answers to my questions. The day was a mix of observations and open interviews. I conducted eight interviews, including three small talks, three open conversations and two in depth conversations.

I expected the Fablab to be a white cube situation with flexible workstations on one side and the latest digital production technology to the other. In this image I projected young designers, wearing self-designed glasses, gazing at their MacBook Pro's and sipping double espresso's from recycled



Photo: Mariska Hamelink, *Entrance to the FabLab @ Waag Society*.

takeaway cups. The creative production process I pictured to be one hundred percent digital and mostly linear: The finished product is a digital document ready for 2D or 3D printing and the print can be of any given material. To make a print of your product, you choose a material and hand over your digital document to a specialist who converts it and operates the machines to produce it for you. Moments later, you can pick up your print at the counter. Educational activities within this context I expected to comprise learning to design with the required software for 2D and 3D modelling. However, the added value of this visit was valuable alone to refute this preconceived image.

The FabLab Amsterdam is located in the old Waag and former medieval city gate on the Nieuwmarkt. Next to the door in the middle west tower you can find a modern aluminum nameplate with a doorbell. To enter the medieval bastion, you first need permission from the receptionist. I enter the building through its one-meter thick wall and start climbing a heavy stone staircase. On the stairs I am caught up by a young guy. With an Australian accent he asks me what brings me to the Waag. After a brief introduction of myself as an architect, educator and a first time visitor of a FabLab, he replies enthusiastically: "Do you have an idea or design?". I explain him that the purpose of my visit is to observe and to find out who is using the FabLab, and he offers me a personal tour through the FabLab and an introduction to its users.

My guide is called Anthony and since 5 to 6 weeks he volunteers at the FabLab. Previously he worked as a teacher in London, because "It's easy to get a teaching job there". He can not officially work in the Netherlands, but "for design this is the place to be". Anthony has a background in mechanical engineering, education and recently he graduated in architecture. At the FabLab he is improving his 3D modelling skills in Rhino to develop "this very unique skill that sells itself". He has an idea for a business, but he learned from friends that entrepreneurship is very difficult when you do not have a distinctive product or skill. Anthony's goal is to "eventually get a job". Anthony's story is a striking example of the normalization of precarity, which was highlighted by Joost de Bloois in his lecture 'Precarious Pedagogies: Knowledge production in the Age of Cognitive Capitalism' (Bloois, 2015). The Fordist 'job for life' is disappearing. Instead we invest in ourselves for the promise of happiness, which means the promise of a 'normal life'. In this neoliberal process of self-precarization free labor in the form of internships and volunteer jobs plays an increasing role.

When I enter the large room above the main gate, the first stop is the high coffee table with large pots of very strong filter coffee. Besides the free coffee this room offers a large work desk with four fixed computers, a fully equipped electronics workbench, a seven year old laser cutter and a six times larger, state of the art laser cutter freshly delivered from China. The opposite large room is equipped with workbenches with untouched bench vices. At ten in the morning 10 to 15 people are working here on their laptops sitting on barstools. Placed around the workbenches are a wardrobe, a soccer table, a desk with two 'Ultimaker' 3D printers, a movable video conferencing system and some large, wooden prototyping leftovers. The room is spanned by old, massive, wooden beams. On the outside corners of the room, there are two small towers. One serves as an intimate conference room and the other is an escape route. In the middle east tower an Open Wetlab or BioLab is furnished. Anthony explains that an architect experiments here with growing structures of mushroom mycelium for housing. The lab reminds me of my high school chemistry lab with Erlenmeyer flasks, pressure cookers, petri dishes and refrigerators. Stately portraits of award-winning designers hang between the small windows and a retro school poster of 'the cell' decorates the opposite wall.



Photo: Mariska Hamelink, *Flexible workstations in the FabLab*.

Anthony introduces me to an artist in her fifties called Debby. She experiments with lasering line drawings on the old laser cutter. She was born with a visual impairment and walks with a cane. Debby found out that she must make art for her wellbeing, otherwise she gets very dark dreams. The line drawings she makes by hand and after vectorizing them in Illustrator she laser cuts them out of wooden panels. She explains that due to these experiments her way of drawing changed. In her work 2D, 3D and motion come together. She pictures her experiments in a spatial installation of line drawings of nudes, some erotic some not, on moving and rotating gear wheels. Her experiments also generate side products, such as a lampshade for her studio. Because she has little money, she signs up for the laser cutter on the open days and uses wood leftovers. Previously she experimented with the large CNC milling machine, which is located in the adjacent 'dust room', where you can also find an equipped carpenter's workbench.

The CNC milling machine can drill curved shapes from large wooden blocks or panels from one side. Impressed by the size of the machine, I ask Anthony how long the FabLab already exists. With a wink he answers: "Well, it is here since the 1600s...". He refers to the anatomical experiments that took place in the 17th century in the anatomy theatre in the attic of the building. Rembrandt van Rijn's famous painting 'The Anatomy lesson of Dr. Nicolaes Tulp' depicts the anatomy lessons that Tulp gave here in January 1632. As part of their extra training, the Amsterdam Guild of Surgeons attended practical demonstrations in the anatomy theatre to gain a better understanding of human anatomy (Museum het Rembrandthuis). Besides the guild of surgeons the Waag also housed the guilds of smiths, painters and masons on the upper floors. Each guild had its own entrance, the smaller towers at the corners of the building. Above the doors you can still find the ornate emblem of each guild.

Anthony apologizes that he needs to go back to work and with a self made coffee and my M&M's I take a seat next to media designer Sanneke. She experiments with ingeniously folded paper lamps inspired by the 17th century millstone collars. Similar to the collars worn by the surgeons in Rembrandt's painting of Tulp's anatomy lesson. She started her experiments with a lace collar from the collection of the



Image: Rembrandt van Rijn, The Anatomy lesson of Dr. Nicolaes Tulp, 1632, painting, 169,5 x 216,5 cm, 's-Gravenhage, Mauritshuis, bron: <http://www.rembrandthuis.nl>

Rijksmuseum, where she teaches workshops in the media lab. But this is a personal project. Maybe the lamps turn out to be suitable for sale, but that's not the goal. For years she worked only digital. After processing the digital input and manufacturing of the lamp pattern, she engages for hours in the handcraft of folding. This has a meditative effect on her. Her experiments are a search for form, technique, pattern, material and light play. The pattern of the lamp she is currently working on is a variation on the 'magic ball' principle in origami, a hobby from her childhood. The goal for today is to experiment with another technique. She is using the vinyl cutter instead of the laser cutter. Partly because of the queue for the laser cutter. The vinyl cutter is also smaller and far cheaper, what makes it interesting for personal use at home.

During my exploration of the rest of the building I meet Alex in the Mason Guild Room. Alex is co-founder and instigator of the FabLab. With great enthusiasm he shows me the original 17th century 'meesterproeven' (MH: master pieces) of artistic masonry. Especially the Mason Tower, hidden behind the room, is a showcase of impressive masonry techniques. He refers to the fitting name he gave to the FabLab at this historic place: 'makers guild'. He tells about the demise of traditional crafts, not only in the Netherlands, but worldwide. Alex is inspired by traditional Japanese wood joints, which he thinks can be an interesting alternative to the prevailing FabLab tooth connection, already recognizable as the 'FabLab style'. He believes that traditional crafts and new techniques of making can find each other here. The FabLab has much more to offer than just digital engineering he states. Alex sees himself as a homo universalis, with a background in instrument making, jazz music and art, and as a role model. Within the FabLab he made a table and a bass guitar, mainly to inspire others.



Photo: Mariska Hamelink, *Manson Guild's master pieces*.

I ask Alex if the FabLab is also used by people without a technical or artistic background. Two engaging anecdotes follow, one of an old lady who learned to laser cut the silhouettes of her grandchildren and one of a 14 year old boy who adapted his football shoe sole to his shorter leg to prevent injuries. However, Alex thinks that in practice only some people are interested in making their own things. It seems that the FabLab promise that anyone can make almost everything, has a higher threshold. I ask him what the role of education is to bridge this gap. Alex admits that his focus is primarily on professionals and he starts a passionate plea for the international Fab Academy, an intensive six-month course of MIT which costs €5000,-. He shows me impressive portfolios of alumni at fabacademy.org. The FabLab in Amsterdam is part of a global network and all users are committed to document their work and share their knowledge on the website for others to benefit from. He advises me to contact his colleague Cecilia with my questions about education.

Back at my 'flexible workstation', I watch a Spanish student making photo's of wooden miniature figures of Amsterdam buildings. Ismael is interested in wood and its fabrication process with the CNC milling machine. His research shows and questions the boundaries of this technique and the material. What started as an experiment, inspired by the iconic building sets of the firm Muji, became his main project. Ismael explains that a FabLab relates more to the machinery than to the material. The work of a designer is finished with the digital design, while with hand made products decisions are often made during the process. He combines the two ways of making in his search for an alternative to the universal FabLab look and feel of a product. He states that time and space for in depth research are often lacking in this context of rapid prototyping. Since February, Ismael is intern at the Waag. He studies Industrial Design at the Technical University Eindhoven. This month he finishes his internship and after the summer he starts his graduation project. He wants to graduate with a project on wooden design toys. "There is a market for that in the Netherlands".

According to Ismael, the FabLab can live up more to its role of cultural institution by contributing to the community and inspire people, a role that the guilds had in the middle ages. He refers to Sennet's theories on craftsmanship (Sennet, 2008). The trial and error method of the FabLab confronts Ismael. "Why constantly reinvent the wheel?". This way most users stick to what they already know instead of bringing it to

the next level. He prefers to start with some basic tutorials to learn a new technology before experimenting further. I draw a parallel with what Blikstein calls the 'Keychain Syndrome' (Blikstein, 2013) and mention that the format of the FabLab ['handy guide'](#) already surprised me. It only gives instructions on technical requirements for the 2D drawings and 3D models in relation to the machinery. There is no information at all about making a design or how to use the required software. But to which extent must the FabLab lower its threshold? Ismael recommends the book 'On craftsmanship' by Christopher Frayling as a must read for anyone interested in the merge of arts, design, crafts, digital fabrication and education.

I agree with Ismael that the most interesting (MH: and recent) chapter is the last 'The New Bauhaus', an essay on Frayling's thoughts on a contemporary Bauhaus. According to Frayling a contemporary Bauhaus would be an instance of professional education which extends into the community. It would be a research institute with "inclusive design, design for everyone, design which really understands users, and a lifestyle laboratory or digital playground which businesses, artists and designers will want to wire into" (Frayling, 2011, p.137). Learning 'through' art and design would play a central role, which means using art as a medium for teaching skills as making, problem solving, ingenuity and autonomy (p.139). According to Jeroen van den Eijnde the Bauhaus mainly provided a conceptual model, a radical experiment in which the boundaries between the fine arts and design, between art and society and art and technology are broken. Despite conflicting views, Bauhaus was held together by a common goal: 'to improve the quality of everyday life in the present and to make it affordable for all.' This 'spirit of social responsibility' was not only practiced theoretically, but was also shaped in practice (Eijnde, 2010).

Meanwhile, we seem to face the complex task of connecting art, science and technology in art and design education. Of course there are contradictions in bringing together these disciplines. But the Bauhaus Model teaches us that such an obstacle can be overcome by jointly formulating an idealistic goal to which the objective knowledge of science, the subjective nature of art and the technical applications are made subordinate. I believe that blending the boundaries of arts, design and engineering, traditional and digital tools in education can enrich the creative process. I have experienced this during my education and career. Especially within the design process that is taught in the architecture studio. In the educational programs and installations I make, the process of designing around content is central to the learning experience of the participants. A process often referred to as creative problem finding and solving or design thinking.

Within Maker Education the making with new technical tools within a digital fabrication lab is often put in the first place. Digital fabrication labs, FabLabs and 'makerspaces' are generally defined as sites for creative production where people can blend digital and physical technologies to construct an idea into some physical or digital form. However, Maker Education is often linked to science, technology, engineering and mathematics, a combination of disciplines which in the United States is referred to as the STEM curriculum. These disciplinary boundaries in Maker Education seem inauthentic to the interdisciplinarity of creative production or making. Several education professionals in the United States advocate for a more interdisciplinary approach by adding the A of Arts to form STEAM education. Kylie Peppler proposes that "design thinking provides a common ground for both the arts and STEM." (2013 p. 41) and that such disciplinary intersections contribute to the broadening of participation.

Mariska Hamelink

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