South Korean Makerspaces as a Public Interdisciplinary Design Practice Platform:

Attempts and Progress So Far

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(ABSTRACT)

Digital fabrication tools were never a new fashion in South Korea. Nevertheless, the separation of the fabrication process from the whole design scheme has diminished the benefits of digital fabrication. It yielded repetitive cycles of design iterations and experiments which were considered to be complicated and time-wasting processes. Also, the lack of proper fabrication facilities within universities made it difficult to provide newer digital fabrication-based interdisciplinary designs, or to give collaboration experiences to their students.

However, the recent prevalence of tech DIY culture, makerspace, and affordable CNC tools, such as 3D printers, is giving birth to more seamless connectivity in design processes throughout many different fields. Grass-roots practices such as Hacker Space Seoul and Fab Lab Seoul are some of the new attempts to construct interdisciplinary design practice platforms outside of the academic domain. The targeted artifacts range from furniture and 3D-printed objects to 3D printers themselves.

In addition to the civilian sector, the South Korean government has also noticed the potential of this new movement from its very beginning. Under its new economic agenda, 'Creative Economy', entities such as the Small and Medium Business Administration are eager to provide affordable prototyping facilities to hardware entrepreneurs. In the same vein, the government announced its plan for 'Muhan Sangsang Sil (Infinite Imagination Space)', a nationwide network of CNC-equipped makerspaces.

These top-down approaches of the government can only work successfully when combined with bottom-up practices from the civilian sector. In order to do so, the presence of a mediator who can understand and communicate with individuals from multiple backgrounds is crucial. Additionally, the ability to see beyond 3D-printer hype and encourage users to focus on sustainable or environmental issues are further required.

1. INTRODUCTION

Digital fabrication tools occupy an important position in today's interdisciplinary design practices. Individuals without crafting skills are now able to physicalize their ideas with a quality similar to today's commercial products. The technology tends to naturally encourage people from various disciplines to invent their own methodology in designing. Likewise, even those equipped with relevant skills can learn from people from other domains in order to externalize their idea and to transform the acquired knowledge into their own language.

The recent thriving of open-source hardware/software has influenced the emergence of shared workspaces – fablabs, hackerspaces and makerspaces – equipped with digital fabrication tools and gradually expanding their significance as public interdisciplinary design practice platforms. Here, without any limits on user diversity, the

space allows individuals outside academia to share and experience some of the latest achievement forms of various disciplines.

In this article, previous experiments and the history of a number of established Korean makerspaces will be introduced, followed by selected interdisciplinary design practices from these spaces. Furthermore, recent movements in the public sector, its limitations and future prospects will be analyzed.

2. BACKGROUND

Digital fabrication with CNC tools was never a new fashion in South Korea. In Seoul alone, there are multiple industrial areas of highly concentrated microfactories equipped with laser cutters and CNC milling machines. However, easy access did not necessarily lead to advancement in interdisciplinary design practices. Though many students, designers, and engineers are acquainted with the process of machines, the scarcity of proper, integrated fabrication facilities in Korean universities made it difficult for actual hands-on experience with a newer sense of multidisciplinary collaboration within their studies.

As the constant reduction in the number of students becomes a threat, many universities are briskly going through intensive restructuring. This restructuring has caused schools to withdraw investment for building new facilities and other possible fixed expenses. Besides, students from other departments have been outsourcing the fabrication process to the so-called 'microfactories', as schools with advanced facilities limit workshop access to its department students. Such a custom has been deteriorating the sense of form generation in relation to the fabrication process, thus undermining students' ability to conduct their own projects.

As the number of young online-based practitioners increases, more people are longing for more effective space for interdisciplinary collaboration such as these shared digital fabrication workspaces.

3. MAKERSPACES OUTSIDE OF THE ACADEMIC DOMAIN

While many universities remain reluctant to invest in serious interdisciplinary fabrication facilities, the movement outside academia has become more active and variegated. In the developing stage, spaces that focused on interdisciplinary workshops and hands-on practices have started to appear since 2011. Though these so-called 'makerspaces' are not yet in a completely polished form, like their precedents in Europe or America, they are gradually receiving more attention as they provide a more free and open atmosphere for practitioners from all professions.

The biggest difference between traditional workshops and makerspaces is that a makerspace does not limit its area of interest to one particular discipline. Studies and subjects of a different nature can be handled in one space, and the list of interests can be extended by new members with an interest in other subjects. In this manner, digital fabrication tools function as a versatile platform that can be applied to create solutions among many different subjects.

The following section provides a brief history of the two major makerspaces that I have been involved in as a user and a founder.

3.1 Hackerspace Seoul

There is no question that Hackerspace Seoul (HSS) marks the first chapter of makerspaces in Korea. Founded by media artists Song Ji Hyun and Dan Mikesell, it was the first alternative space that mainly focused on 'making'.[1] HSS first started in a small container box provided by a subculture art space, Platoon Kunsthalle, in early 2011. In 2012, HSS moved to Eulgiro, which is one of the aforementioned industrial areas packed with microfactories. Here, with the support from KOFAC (Korea Foundation for the Advancement of Science &

[1] For more information see the website, last viewed 7 May 2014 <http://www.eloquence.co.kr/index.php/hackerspace-seoul/>

Creativity), HSS was able to organize multiple events, projects and exhibitions for the general public.

HSS also became an incubator for Korea's first 3D-printer start-ups. Started as a hobbyist project between two high school friends, 'Opencreators' now has become the most successful 3D-printer manufacturer in Korea. In the beginning, they only sold 3D-printer kits through workshops. But in 2014, their first complete 3D printer 'Almond' won the Red Dot Design Award for the first time in the 3D-printer category. However, HSS closed its door in 2013 as many of its core members left Seoul.

Figure 1. (left): Founders of Opencreators with their 3D printer in Hacker Space Seoul[2]

Figure 2. (right): 3D printer 'Almond' (*Photos courtesy of Opencreators*)

3.2 Fab Lab Seoul

Fab Lab Seoul began in March 2013 as an affiliate of a non-profit organization for start-up assistance. Started with a crowd-funding project for its laser cutter,[3] it claimed to be the first fully fledged digital fabrication space in Seoul. It is located in Sewoon Sanga, a once luxury apartment which now has become an ugly mega-structure packed with tiny electronics stores.

Surprisingly enough, it received a lot of attention from universities, enterprises and other institutions as soon as the lab opened its doors to the public. Most of them were interested in outsourcing hands-on workshop programs for their members, as they were yet to decide whether it was appropriate to have their own facilities. The contractors included the Ewha Womans University, the British Council, the Korea University Invention Association and others.

Besides the bright prospect for its self-sufficiency, the lab was now expected to take on the financial burden of its host organization. This resulted in an excessive workload and impotent proposals for business expansion which led to a quick withdrawal of its core members who were expecting a rather unconventional, creative work environment. Luckily, this situation has been improved as SK, the biggest telecommunication company in South Korea, started sponsoring the lab.

4. SELECTION OF INTERDISCIPLINARY DESIGN PROJECTS

Most of the workshops in HSS and Fab Lab Seoul are targeted at the general public. Hence, the results often remain at a craft or simple machine usage practice level. However, there are projects from its core members with serious motivation for interdisciplinary design, and these will be reviewed in this section.

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[2] 2 <http://www.seoul.co.kr/news/newsView.php?id=20120623025045>

[3] For more information see the website, last viewed 7 May 2014 <http://www.goodfunding.net/gf/project_view&prj_code=13010065>

4.1 Bio-photography Project

Yoon Suh-yeon is a graduate school student in biology. Dan Mikesell is a media artist who teaches at a university. They met in HSS and created an idea that nobody had dared to try outside of the laboratory before: screen-printing with bacteria.

Kaede protein is a photoactivatable fluorescent protein that originated from stony coral. With the irradiation of ultraviolet light (350–400 nm), Kaede undergoes irreversible photoconversion from green fluorescence to red fluorescence. After the photoconversion, the photoconverted Kaede protein emits bright and stable red fluorescence. This fluorescence can last for months without anaerobic conditions.[4]

After transforming the protein into an e-coli strain, bacteria are placed on an agar plate inside an incubator. Later, when bacteria proliferation is sufficient enough, black and transparent film masks are attached and the badges are exposed to UV light for 24 hours.[5]

Figure 3. Bio-photography results (*Source: Photography by Dan Mikesell & Yoon Suh Yeon*)

4.2 Very Large Delta Printer

The Very Large Delta Printer (VLDP) is a delta-robot type fused filament fabrication (FFF) 3D printer based on the Kossel open-source 3D-printer project. It was a pilot project from an interdisciplinary design study group, Fab 3, of which the three members have different academic/professional backgrounds; Hunmin Koh (mechanical engineering), Hyun Park (designed objects), and Kate Cho (architecture and urban design). With an overall height of 1200 mm, the printer is able to print 3D objects up to 500 mm. Due to its large size, a second set of arms was attached above the hot end with an extra platform for a Bowden extruder. This was to keep the distance between the hot end and the cold end constant in order to reduce friction of the filament located inside the Teflon tube.

Besides its technical specs, builders wanted to emphasize the possibility of a 3D printer as an aesthetic object. They wanted the machine to be recognized as a kinetic sculpture and not just as a printer with a large volume. It was this particular goal that affected the decision to build a delta type printer, which portrays an elegant and captivating movement within the building process.

The printed objects, along with the printer itself, needed to feature unique characteristics of additive manufacturing. Kate Cho, an architect and versatile designer, has been studying the formation of crystals for several years and had been experimenting with its morphology in her projects. The group printed a

[4] <http://www.pnas.org/content/99/20/12651.full.pdf>
[5] For more information see the website, last viewed 7 May 2014 <http://www.instructables.com/id/DIYbio-Living-Photography/>

parametrically generated model of a crystal with a transparent filament. As the crystal grows, the light from an LED bulb beneath the build plate passes through the crystal and thus changes the color of the space where the machine is installed.

Figure 4. Very Large Delta Printer (*Source: Photography by Koh Hunmin*)

4.3 Capturing Flow in 9×9

Capturing Flow in 9×9 is a series of 3D-printed vignettes of 3D-scanned soft materials such as textiles and paper. Shin Ji Yoen is a master candidate in sculpture. Her main interest focuses on the instantaneity of things. She emphasizes this by capturing or magnifying the disappearance of sculptures.

Trained and practiced as a traditional sculptor, Shin was not familiar with digital tools. However, after becoming exposed to 3D-printing technology at Fab Lab Seoul, her interest in technology led to these experiments. By scanning a piece of clothing and folded paper, she succeeded in preserving the temporal state of the material. It is interesting to see how the printed artifacts reflect not only the form but also the materiality of the original material.

Figure 5. *Capturing Flow in 9×9 (Source: Photography by Shin Ji Yoen)*

4.4 Wall-mounted Plotter

Hyundai Card is a Korean credit card company famous for its innovative branding design strategy. "In May 2013, the company held its first design exhibition in Seoul, giving a behind-the-scenes look at its design projects from 2002 to 2013. To recreate the feeling of a design studio where things are continuously created, the design team wanted an XY plotter that works ceaselessly throughout the exhibition opening, producing objects and drawings designed by the design lab."[5]

To achieve this goal, the company collaborated with Kim Sung Su, a multidisciplinary maker with mechanical engineering and electronics guru product designer background. He was also an active member of Hacker Space Seoul and the manager of makerspace YDBG in Daejeon, South Korea.

The plotter was designed to be mounted on the wall in order to arrest the attention of audiences at first sight. As the gantry-type tool head draws characteristic typography and diagrams designed by Hyundai Card, the machine automatically pulls down a new roll of paper.

Figure 6. Wall-mounted Plotter (*Source: Photography by Kim Sung Su*)

4.5 'Is This Also a Musical Instrument?'

Though the project did not actually take place in makerspaces, '*Egutto Akgi Ilkayo?*'(이것도 악기일까요?, '*Is This Also a Musical Instrument?*') was the first large-scale project that rallied many makers with both direct and indirect connection with the maker community. The goal of the project was to create a new type of musical instrument using familiar technologies in the community such as 3D printing, laser cutting, physical computing, etc.

Sponsored by Education Broadcasting System (EBS) and Art Council Korea (Arko), eighteen participants with different backgrounds collaborated to build instruments that have never existed before. The participants included a musician, a media artist, a sculptor, a sound engineer, a mechanical engineer, an architect and a designer.

Throughout the three months of the project period, the created instruments included a gear-shaped tonewheel organ, a motion-activated guitar, 3D-printed bottle caps that turn an empty bottle into a wind instrument, and a solenoid-controlled water-drop piano. EBS recorded most of the production process and the final performance to

make a documentary. This was aired in May 2014.

Figure 7. The final performance of the project (*Source: Photography by Gil Gi Yoon*)

5. PUBLIC SECTOR

Inspired and encouraged by the movement from the civilian sector, the government was quick to adopt this new idea of makerspace into its own plans. In August 2012, the Small and Medium Business Administration of Gyeonggi Province opened a makerspace for hardware entrepreneurs even before the formation of Fab Lab Seoul. However, the output from this space varied from our interdisciplinary design.

Two major movements from the public sector that focus on archiving, knowledge sharing and community building will be mentioned in the next section.

5.1 APAP Making Lab

Making Lab is a makerspace based in Anyang city, one of Seoul's satellite cities. It is also part of Anyang Public Art Project (APAP), which aims to revitalize the dilapidated part of the city through art and culture. "The lab provides open access for the public and presents different types of workshops and performances led by artists from Korea and abroad. At the same time, it serves as a channel for introducing open source technology to the public."[6]

Making Lab organizes various preparatory programs for local teachers and artists. The quality of workshops that Making Lab organizes surpasses those of other alternative spaces. Although they are designed for the general public, their creative way of questioning and finding answers has also captivated many artists. "By holding regular workshops, Making Lab demonstrates artistic potential based on the application of open source technology. In addition, it explores an archetype of sustainable lab or studio, driven by the local community's needs and participation."[7]

[6, 7] For more information see the website, last viewed 7 May 2014 <http://apap.or.kr/en/makinglab>

Figure 8. 'Poetics of Circuitry' workshop in Making Lab (Source: *Photography by Hong Chul Ki*)

5.2 Infinite Imagination Labs

Muhan Sangsangsil (무한상상실, *Infinite Imagination Labs*) is the latest and largest movement led by the government. The project is a part of 'Creative Economy', a rather broad term aimed at putting the value of creative scientific imagination on the Korean industrial map. With an audacious plan to build a nationwide network of 244 labs by 2017, the government launched five citizen-participating social labs in four cities across the country in 2013.[8]

Muhan Sangsangsil in Gwacheon National Science Museum is by far the largest of the five labs. The lab has 12 different cells with a total area of 1,665 square meters. It is equipped with various facilities including electronic circuits, 3D printers, a CNC router and laser cutters.

Originally opened in August 2013, the lab has been serving as a center for interdisciplinary design and fabrication practice for surrounding institutions. Also, it has been supporting various outreach programs for external maker communities. In return, members of communities provide workshops and technical advice aimed at labs to strengthen the specialty of the space. Creating such a virtuous cycle and getting support from users are crucial at the beginning of the projects, particularly in order to create a free atmosphere and cooperate collectively with different individuals.

Figure 9. (left): Muhan Sangsangsil before expansion[9]

[8] <http://koreabizwire.com/imagination-lab-for-building-soft-power/1932>
[9] <http://hellopolicy.tistory.com/61>

Figure 10. (right): College students testing their project (Source: Photography by Koh Hunmin)

6. ASSESSMENT

As aforementioned, makerspaces in Korea showed quantitative growth within a short period of time. Also, the government's policy to foster its own and civilian communities can be considered progressive and innovative. However, being relatively new, there are some issues that must be discussed in order to improve interdisciplinary collaboration practices in these spaces.

6.1 Documentation and Knowledge Sharing

Although largely influenced by open-source technology, the Korean community and makerspaces have not contributed much to the open-source community. Many of the projects usually end up with rather superficial documentation with mere pictures and descriptions on paper.

The main reason for this is that people think the documentation is only an optional part in the execution of a project. However, a comprehensive, detailed tutorial is essential to facilitate a multidisciplinary collaboration project. The major problem with makerspaces lies in the lack of obligation of its users to document their projects.

The case of Fab Lab Amsterdam in the Netherlands gives us some insight. Fab Lab Amsterdam has two 'open days' – Tuesdays and Thursdays. On an open day, users have the opportunity to earn back their fees only when they have finished the online tutorial of their projects. This could only work well where this a sufficiently high fee that will encourage the user to finish the documentation, as time spent on documentation is often longer than that spent on the actual designing and fabrication itself.

6.2 Artist-dominant Projects

Since artists are relatively free to organize their time and are not bound to a single institution, they are the main user group of makerspaces. Although many artists in the scene have different backgrounds, collaborating with individuals with different professions is somewhat limited. Therefore, interdisciplinary projects practiced in makerspaces mainly focus on artistic projects that tend to be temporal with less persistent effects.

Due to the limited number of users at makerspaces, the user group of one makerspace tends to overlap with that of another space. Further efforts are required to diversify the user group to provide a better interdisciplinary experience.

6.3 Environment, Material, and Locality

With its relatively short history, most of the projects in the makerspaces have not moved on so much from initial fascination with digital fabrication tools. Many users stick to some basic makerspace materials such as MDF, acrylic, and 3D-printer filaments. Therefore, further experiments on more sustainable and locally available materials and the active application of output form preceding studies are required.

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