

# The FabLab Network in Japan: Preliminary Ethnographic Observations

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## **Abstract**

In this paper the author outlines the theory, method, and preliminary findings of a six-week ethnographic study among the "makers" in FabLabs in Japan, concluded on August 16, 2013. The project aims to describe the "maker" community in order to show in ethnographic detail how new technical tools can create new social outcomes, particularly new pathways to innovation. The theoretical framework draws on Edmund Leach and Martin Ortlieb's conception of cultures as amalgams of customary practices, as well as actor-network theory (ANT) and socio-technical systems (STS) theories from Bruno Latour, Robert Oppenheim, Brian Pfaffenberger, and Gary Downey. The methodology involved visits to seven FabLabs across Japan, interviews with FabLab directors and patrons, participant observation, and attendance at a Mini Maker Faire in Yamaguchi. Future dissertation research planned for 2014 includes focused ethnographic work in a single FabLab, social network analysis through surveys of "makers", and textual analysis of web-based "maker" community communication platforms.

## **Keywords**

FabLab, maker movement, ethnography, Japan, actor-network theory, socio-technical systems, innovation, emerging culture, digital fabrication

# The FabLab Network in Japan: Preliminary Ethnographic Observations

Matt Krebs, University of Kentucky, August 2013

## **Introduction**

In this paper I outline the theory, method, and preliminary findings of a six-week ethnographic study among the “makers” in FabLabs in Japan. I concluded the research on August 16, 2013, and plan to return to begin my dissertation research among the “maker” community in Japan in 2014.

My purpose in writing is to give readers a glimpse into the work I have begun. My project is to describe the “maker” community in order to show in ethnographic detail how new technical tools can create new social outcomes, particularly new pathways to innovation. This report reflects the pre-dissertation portion of that study.

## **Theory**

In my approach to the “maker” community in Japan I rely on the following theoretical ideas to frame the subject material and my research purpose. First, I see cultures as amalgams of customary practices, not always immutable social norms (incorporating ideas from Edmund Leach and the contemporary Martin Ortlieb). Second, I see actor networks of associations at work in the inventive “maker” communities in Japan. I reflect on socio-technical systems

theories (STS) in this vein from Bruno Latour, Robert Oppenheim, Brian Pfaffenberger, and Gary Downey.

It should be noted at the outset that a few modern writers frame the “maker” identity in writing and in the minds of practitioners in Japan. While I do not attempt a much-needed evaluation of the adequacy of “maker” as the descriptor for my research group, I choose to use it above a common local term in Japan: *mono wo tsukuru hito*, or: “people who make things”, because “maker” seems the best available circumscription of the agents among whom I have studied. Neal Gershenfeld (2005), Hiroya Tanaka (2012), and Chris Anderson (2012) have described the varying contours of what I have thus chosen to call the “maker” movement. While their writing is not directed at an ongoing theoretical debate in anthropology, *per se*, in many ways these authors frame the group that I set out to observe.

### **Culture as Emerging Customary Behavior**

Edmund Leach wrote that: “the subject matter of social anthropology is customary behavior” (1972:152). I take this notion, that anything customary is the substance of anthropological study, to heart as I consider the emerging culture among Japanese people caught up in the movement described by Gershenfeld, Tanaka, Anderson, and others. Framing “FabLabs” and the broader “maker” community as amalgams of customary practice helps me avoid the trap of only seeing relevance in cultural patterns that are immutable and generally cohesive across a population. My overarching purpose is to understand and describe these customary practices as perceived by, formed by, and experienced by Japanese people engaged in the “maker” movement. In this way, I hope to propound an ethnographic description of the

movement as an emerging culture, or: body of customary practices. I will say more about why that is useful in the next section about STS.

To express a further iteration of the dynamic nature of social practice I will cite Leach again, this time as quoted by Pierre Bourdieu: “I postulate that structural systems in which all avenues of social action are institutionalized are impossible. In all viable systems, there must be an area the individual is free to make choices so as to manipulate the system to advantage” (1989:53). I find the “maker” movement to be a prime research workshop for discerning new “avenues of social action” and the proactive manipulation of institutions “to advantage” (ibid).

Martin Ortlieb, an anthropologist and user-experience researcher at Google, Inc., has advocated attention to emerging cultures as a way to understand how broader customs are reoriented as new practices emerge (2009). Ortlieb emphasizes that a focus on “emerging cultures” allows preservation of the useful, historically meaningful category: culture, while making room to investigate the dynamism inherent in agentic systems (190-191).

While the “maker” movement - a young, emerging culture - may be difficult to pin down, it is thus, in fact, particularly useful as a study of agentic dynamism in more established cultural systems such as cities, corporations, or schools. The dynamism of the emerging movement is at the heart of my project and its purpose.

### **Perspectives from STS**

Theories in the STS literature drew my attention to the “maker” movement as an informative emerging culture. STS helps me connect my objectives to research outcomes.

To state the connection precisely: STS helps me theorize about how new technical tools (machines) create a dynamic, emerging culture, and how I can observe and find nuanced

evidence of this associative process. 3D printers, laser cutters, microcontrollers, and a variety of CN tools now used in FabLabs comprise a suite of technical tools that STS theory suggests will catalyze social changes.

Some of this social change story may fit the actor-network model (ANT) framed by Bruno Latour, John Law, and others. A central tenet of ANT is that technical tools are actors incorporated in the social networks of human actors and associations between humans and tools (and various other “actors”) form the influence structure in the social domain (Latour 2005). STS thus inclines to see tools as influential where other frameworks may not. Technical objects alter the range of choices available to people and thus create space for new social futures. Perhaps it need not be asserted further in the literature that new tools make for new human social forms. However, a deeper elucidation of just how humans have come to relish “maker” tools as enablers of new futures seems to promise evidence of how this change can unfold.

ANT is particularly helpful in drawing attention to relationships between humans, machines, ideas, and other entities fitting an expanded definition of “actors” (Oppenheim 2007:475). Emily Martin has asserted that just tracing the establishment of fact inside a social “citadel”, or stable, institutionalized system, may produce only a simplified explanation that lacks nuance (1998). M.J. Fischer, in *Cultural Anthropology* in 2007, asserted that a view of culture as relational helps avoid seeing social action as “pure instrumentality” (Fischer 1), echoing ANT ideas about social fabrics of associations. By observing and interpreting these relationships, or: associations, I expect to find evidence of just how human agents access technical tools to “manipulate [their] system[s] to advantage” (Leach in Bourdieu 1989:53). I anticipate taking corporate innovation as one example of a “citadel” and helping show how the

“maker” movement and the active manipulation of associations among its agents has begun to echo inside corporate “citadels”.

In another widely read book in the STS domain, Gary Downey wrote about his study among young computer programmers in associations with their terminals (1998). I find Downey’s depiction of terminals and the digital acting of programs helpful in thinking about the associations between “makers” and the tools they use. “Maker” tools likewise can thus function as extensions of “makers” own agency and feedback on that agency with their own computational agency.

Brian Pfaffenberger’s writing on the human fetishization of technological objects outlines another tenet of STS that helps me see nuanced associations more clearly (1998). Pfaffenberger maintains that technology acts as a “total social phenomenon” (236), citing Marcell Mauss, in the sense that it affects every aspect of the social realm. From this perspective, I perceive a deeper interactive connection from humans to the tools of “making” than present literature has uncovered, promising a fresh look at how fetishization unfolds.

Robert Oppenheim, reviewing STS for *Anthropological Theory* in 2007, helps me consider how group cohesion is maintained in the disparate “maker” network. Oppenheim pointed out how Latour and Law’s work anchors group cohesion not in the classic anthropological categories: “class, ethnicity and so on” (474), but as a function of technical “intermediaries” (Latour’s word) that can “faithfully transmit the force of cohesive action” (474). This is a final projection of STS theory to address in my study because in the web-connected world of “making”, the centrifugal principles are far beyond (though not to exclude) the standard cohesive cultural categories. Group cohesion may be sparked by machines, by a shared interest in

technical skills, by a passion for open data, by influential people and books, and by FabLabs themselves, for example.

### **Extra-Corporate Invention**

While many institutions (political, economic, and cultural, for example) seem to be re-imagined by “makers”, my dissertation research will focus on how the “maker” movement emerges as a new avenue of possibility for invention, affecting existing modes of innovation. As I intimated above, I predict that what happens in the FabLab and “maker” network will affect the larger social process of innovation, particularly corporate innovation.

For the sake of brevity, I will not include further writing about business and invention theory in this paper. It may suffice for now to point out that Intel Labs™ (Hillsboro, OR) funded my preliminary study in 2013. While I do not guess and cannot know whether Intel Inc.™ has any specific company-wide purpose in understanding the “maker” movement, Intel Lab’s interest in understanding the dynamic movement ethnographically is one indication of influence between the extra-corporate movement and corporate business practice.

### **Summarizing Theory**

A broader exposition of theoretical ideas than I have undertaken here is certainly due the project about which I write. I have used this first section to stitch together, admittedly in broad strokes, my notion that anthropological theory deserves more study of dynamic social spaces and that the novel technical tools carrying forward the “maker movement” have helped anchor an ideal set of emerging customary practices in which to undertake such a study.

## Method

In this section I describe what I set out to do, what I have done, and what I plan to do in order to achieve the research outcomes I have described above.

### **What I Set Out To Do**

To state my research purpose again: my project is to describe the “maker” community in order to show in ethnographic detail how new technical tools create new social outcomes, particularly new pathways to innovation.

I think this can be done by observing the “maker movement” in action. This Summer, I set out to observe Japanese “makers” in seven FabLabs. As an anthropologist I seek evidence in what I can observe people actually doing and saying.

### **What I Did**

By meeting some of Japan’s “makers” in the spaces where their work is in motion, I watched their customary practices *in vivo*, hopefully with some perception of the nuance and complexity of their lived experience.

I focused on key players (FabLab directors) at this stage, across all existing labs, but I expect to extend my time with patrons and observers in the future. I asked questions about what “maker” meant and whether the movement has a discernible “culture”. I asked about open-data sharing and about inventions that may have commercial prospects. I followed the Kitakagaya lab directors to a Mini Make Faire™ in Yamaguchi and observed all kinds of inventions from “makers” in Western Japan, further from the FabLab orbit in Tokyo. I listened to lab descriptions

at every lab. I made my first laser cutter and 3D printer projects at FLAT (Sendai). I chatted with patrons and tinkerers affiliated with FabLabs throughout Japan.

Over the next several weeks I will be processing the fieldnotes I wrote and the content of interviews with FabLab directors and patrons. Against the backdrop of the theoretical frames introduced in section one I will draw out patterns from this data and uncover new curiosities and questions to pursue during my dissertation. I will report findings to Intel Labs™ and learn more from the curiosities and feedback offered by that team of social scientists.

### **What I Plan To Do**

In 2014, I plan to begin my dissertation research in Japan. In order to get the most detail about how “maker” tools generate new social pathways I plan to focus most of my ethnographic attention on one FabLab, continuing to incorporate data from the other labs as context. I will spend significant time in the focus lab (not yet selected) working alongside the directors and patrons and interviewing them.

Social network analysis through surveying “makers” is an additional method that I expect to employ. For example: Hiroya Tanaka might be influential, but how influential? Can the influence be measured as reported by “makers” in Japan, mapped across a “network” of influence? Can a customary practice be shown to derive largely from one person? One book? One machine? A simple survey that queries dyadic associations could depict a rough quantitative picture of the associations existing in the FabLab and “maker” network. Such a survey might incorporate non-human “actors” as potential points of influence alongside human actors. For example: “Who, or what, inspired your interest in establishing a FabLab? Hiroya Tanaka, Neil

Gershenfeld, your own research, a news article?” I will use UCINET to map and analyze the survey data as a network.

I further expect an analysis of “maker” generated texts to complement my ethnographic research methods. The “maker” community, I have seen already, is changing and reformatting through active web fora like Facebook, NicoNico Tech, Thingiverse, Twitter, and weblogs. A certain insight on the prominent semiotic activators within the “maker” community is accessible through a textual analysis of these sites. I plan to aggregate a substantial set of communication recorded in these web-spaces and code the data for keywords and qualitative markers such as comments that: “adjure open data sharing”, “share a self-designed project”, or “cite author X”, for example. While online communication evinces a qualitatively different sort of associative connection between people than an SNA survey, participant observation, or semi-structured interviews, the compilation of methodological perspectives seems necessary because the network is so disparate.

### **Preliminary Observations**

On August 16, 2013, I wrapped up six weeks of visits to the FabLabs throughout Japan, incorporating just observation and unstructured interviews. With the fervent caveat that the following section represents only a preliminary glance at what I think I saw in these “makerspaces”, I offer a two-part report. First, I will talk a bit about each lab. Second, I will reflect on what my data seems to speak back to the research purpose I have introduced.

## **The Labs**

The following descriptions are meant only as a preview of each lab. I aim only to mention a few notable features of each lab to give readers a cursory notion of the each lab's unique character. Without processed data and after just six weeks (half of the labs I could only visit but once) I cannot offer more at this time. The labs are listed in chronological order of opening except the final listing: f.labo, appended at the end because it is not a chartered FabLab.

This segment may justly be read separately as a concise comment on the unique features of existing Fab Labs in Japan.

### *Kamakura*

The Kamakura lab takes up a portion of the home in which Hiroya Tanaka lives. The lab is managed by Youka Watanabe and is a flagship FabLab space in Japan. Nearly everyone I asked during my research had been to the lab. Kamakura is an old city and one-time capital of Japan with a deep tradition and many well-preserved historic buildings and sacred sites. FabLab Kamakura thrives on building local community to a degree beyond the other labs, in my observation. This reflects the values of Hiroya Tanaka and Youka Watanabe. Watanabe interfaces with other shared office and creative spaces in Kamakura, where there is a burgeoning city-wide push for new, creative ventures. I attended a half-day event organized by the lab during which twenty young professionals visited some of Kamakura's vibrant shared workspaces and discussed various ways through which new careers are possible through new tools.

Inside FabLab Kamakura itself, while much of the active use of the machines goes to projects brought by designers of crafts, patrons of all ages come to the Monday open lab sessions. Furthermore, Watanabe keeps an active programming schedule that brings the public to

the lab often. One example is Fujimock Fes, a project that recovers trees slated for clearing around the base of Mount Fuji for use as material in the lab. The participants, who personally work to bring the trees down and back to Kamakura, work their own imaginative designs on cuts of the wood.

### *Tsukuba*

The Tsukuba FabLab (FPGA Café) is run alongside a company called SusuBox by Susutawari (the pen name of Noriyuki Aibe). Tsukuba is home to “Science City”, an area with a number of universities, especially technical schools, and a large science museum. The city feels quiet, wide open and somewhat hidden from the bustle of Tokyo, about 50 km away. The Tsukuba lab is a long twenty-minute walk from the nearest station and no bus goes very nearby (buses are ubiquitous elsewhere as supplements to rail transport in Japan). The location would seem to deter people from knowing about or using the lab but FPGA Café seems well used by a regular crowd nevertheless. FabLab Tsukuba is crowded with books, supplies, computers (old and new) and of course the standard tools for making things. The lab functions during the week as a workspace for Susutawari, designed in part for his daily use and research. Susutawari opens to the public every Sunday from the early afternoon until late into the evening.

When I visited on a Sunday, I met a few other patrons who were not presently working on a project but enjoying conversation on a quiet afternoon about their shared interests.

One individual I spoke with in another city pointed out that the Tsukuba lab was more into the comic book scene (Japanese *manga*) than other labs. Considering that the lab is decorated with a giant comic-book-style wall picture hanging like a tapestry (drawn by a regular patron of the lab), this would seem to be true. Character figurines are set about the Tsukuba lab and a

display shelf holds merchandise designed by patrons of the lab, much of it with a *manga* flair. Susutawari was pleased to show me a manual for using microcontrollers that he designed with a friend in a style merging *manga* and technical manual. They sell the manual along with a kit at a handful of *manga* shops in Japan. FPGA publications can be seen in maker-spaces around Japan.

A final unique and notable feature of the FabLab Tsukuba is that it is the only lab (so far as I am aware) that requires an up-front commitment from users to share any design that they invent in the lab.

### *Shibuya*

FabLab Shibuya is a busy place in a busy part of busy Tokyo. The lab uses space inside a business incubator operation called “co-lab”. Shibuya is a major shopping district in Tokyo and nearly every train and subway line goes through the station. Design firms congregate in that area and its fashions tend to ramify throughout Japan. Inside co-lab and FabLab Shibuya, I observed many people at work on machines, most of whom I never met. Co-lab has a front desk and two floors of offices. The FabLab houses a subset of a variety of machines at co-lab. The director of FabLab Shibuya, Hiroaki Umezawa, came from a design background. He was invited by co-lab to run the FabLab space.

Like all labs, FabLab Shibuya is an open and friendly work environment but there seem to be fewer casual hobbyists operating there. The people I observed working there were on assignment from other businesses. Two men in their twenties were working on a laser cutting project to build a model-sized version of a popular art museum, on behalf of the museum, for example. Also, the people with whom I sat during the lab’s introductory lecture (required of all users) were both reimbursed by their companies for the fee they paid. It seems accurate to say

that FabLab Shibuya is at its core a useful place for local design firms and freelancers to try out new ideas.

### *Sendai*

The FabLab in Sendai, known as FLAT, was just opened in March, 2013, and is the only lab wide open for walk-ins. At this point, FLAT only charges for materials and about \$10.00 (USD) per hour for use of the laser cutter. Three staff members keep the machines humming from 1:30 pm to 9:00 pm five days each week. Staff members work on various other projects during the day (they are affiliated with the Anno Design Lab) but keep their attention on the visitors as they work with the machines.

Part of the atmosphere of the Sendai lab is the effort they have put into making everything in the lab. Lab-manufactured decor is natural for all the labs: however, Sendai, for example, has made even its computers themselves and covered them in a wooden shell cut out in the shape of a character that is the lab's mascot. Bookshelves, light fixtures, and many other things around the office were designed and made there. Located on the fourth floor of a building in downtown Sendai, the laser cutter vacuums air and debris out through the porch, over the busy city street below.

Another unique feature of FLAT is that the lab is fully funded for its first year (ending March 2014) by the City of Sendai, with hope that the lab will spark new creative ventures and a hands-on approach to rebuilding their community, racked by the earthquake and tsunami of 2011. Such reliable funding means that the staff can keep the lab open nearly every day. Among the patrons I met was a woman in her sixties whose lifelong interest in hand-making dollhouses

is in hyper-drive since discovering laser cutters and 3D printers. The open lab allows her to make a host of things (very small things) that she proficiently designs herself now with software.

### *Kitakagaya*

One patron told me that she goes to FabLab Kitakagaya just to hang out as much as she goes to make things. Considering the formidable technical expertise among lab members: “wild” may not be the right adjective but a different patron did use that descriptor when talking with me. FabLab Kitakagaya is run by three talented “makers” as a member-supported lab with an especial interest in sustainable manufacturing. Members pay about \$20 per month and there are about sixty members at this point (open since March, 2013).

The city of Osaka, of which Kitakagaya is a heavy industry segment situated on the bay, is reputed to be the fast-talking, more colloquial big city in Japan: counterpoint to Tokyo. Osaka is an historic port: a trade center before Tokyo’s rise to prominence. Osaka is the hub of business activity that complements the cultural center in nearby Kyoto.

The group that opened the lab began meeting after Kazutoshi Tsuda, a sustainability science professor at Osaka University, met Hiroya Tanaka at a conference. The team scouted a location for months and settled on a derelict industrial workshop space. Wide open (no doors) on both ends, the team built a wooden enclosure inside the empty workshop to house their expensive machines. I had to borrow from their supply of bug spray but enjoyed feeling part of the world around. The lab brims with the reputed Osaka exuberance.

Kitakagaya is the only lab I visited with a large enough milling machine on site to cut large pieces of wood. All around FabLab Kitakagaya heavy industrial workshops are in full operation so the Woodpecker CNC milling noise hardly offends the neighbors. One team project was a bar

for serving drinks – now fully stocked and well used. I was kindly offered a drink first thing on my first visit.

A common weekend lab activity is to gather on Saturday morning, pick a thing to make and spend the next two days playing and making that thing (drinks included). Everyone works on a different portion of the design and its prototypes: they all have different expertise. One project idea was to make sandals, for example.

### *Kannai*

FabLab Kannai opened just as Fab9 wrapped up in Japan. My first visit to a lab in Japan was to FabLab Kannai, guided by Furukawa. Kannai is a town in the important port city of Yokohama, a hub of global activity. The lab is housed in a shared office and event space called Sakura Works, run by the non-profit Yokohama Community Design Lab (YCDL). This open workplace shares the open-network philosophy of the “maker” movement and has supported the interest of a young graduate student, Hideyuki Furukawa, in opening a FabLab. For Furukawa, opening the lab in Yokohama doubles as a capstone project for his graduate degree in media arts. With support from Hiroya Tanaka and YCDL, a number of events have already been held there, bringing in dozens of people interested in making things.

The Kannai Lab has been running with just a few machines so far, borrowed from Dr. Tanaka’s Social Fabrication Center. Lightheartedly, for the press conference held to announce the upcoming opening of FabLab Kannai (and Fab9, in fact), Furukawa built a cart with two wheels and two handles out of wood to carry all his machines. The lab that thus excelled first in compact design, however, may quickly grow into one of the larger labs in Japan. Some machines from Tanaka’s lab at Keio University are expected to transfer to the Kannai lab.

## *Ogaki*

Ogaki is a quiet inland town three hours West of Tokyo. It is home to Softopia, a large business and technology park funded by the Japanese government. Nearby is the Institute for Advanced Media Arts and Studies (IAMAS), which grants master's degrees to about forty students per year. Professor Shigeru Kobayashi at IAMAS established f.labo through a partnership with Softopia. F.labo is used by IAMAS students and teachers for hands-on learning. Classes are sometimes held there. The lab is also used by startup tech companies growing in incubator offices at Softopia. F.labo manages to do public events and open for free use periodically.

F.labo is not chartered as a FabLab but interacts often with the Japan FabLab Network. F.labo focuses on training students and supporting the local business community. That connection sometimes means that data and designs in the lab cannot be shared freely, though sharing is the rule of thumb.

One fresh example of student-business-lab collaboration is the new company: Gocco. A group of five graduated IAMAS students started Gocco, making software and gadgets. Gocco opened a retail office near the Ogaki train station, called: Soup, and sells a number of items designed and created at f.labo. The university-business connection thriving at f.labo keeps the machines busy and gives the students fantastic training.

## **Answering the Research Question**

My project is to describe the “maker” community in order to show in ethnographic detail how new technical tools create new social outcomes, particularly new pathways to innovation. I conclude with some brief preliminary ideas emerging from my work so far.

### *Tools Create Space for New Social Pathways*

STS ideas about the explanatory power of observing associations between people and objects lead to one overarching research finding: the “makers” I observed would not have organized labs nor begun to actively pursue new social ends without the advent of affordable and useable tools. Some “makers” reported having been always interested in taking things apart and making new things. However, the energetic grouping of people in labs seems to be carried forward largely by their having the experience of successfully making things with previously inaccessible tools. Everyone seems to revel in the fun of going from idea to computer interface to tangible thing and in using tools that were inaccessible in public spaces until very recently. The accessibility of the tools common to FabLabs seems absolutely integral to the motivated and purposeful time people spend in FabLabs and talking about FabLabs.

### *Key People Can Change the Pathways*

Another preliminary but clear and meaningful finding so far is that key people matter. 3D printers, laser cutters, and microcontrollers existed before Neil Gershenfeld had a lab for making anything. Yet his lab, his class and his subsequent book framed them together for a distinct purpose and coupled them with ideas about personal fabrication: a compelling do-it-yourself vision for a world not yet created. Everyone in the “maker” community in Japan has read or knows about Gershenfeld’s book. This is not surprising, perhaps, but very significant when framed theoretically. Individuals like Gershenfeld and Tanaka, whose book is likewise widely read in Japan as a guide through the state of “making” in Japan, upon associating themselves with the new creative capabilities of technical tools, are enabled to frame a vision that motivates many others to invest their own agentive energy.

### *Centrifugal Principles Keep Groups Coherent and Nourish Invention*

A final finding follows: the loose associations of people and things across temporal and digital space in the “maker” community cohere around some kind of discernible set of customs, values, and tools that I have come to consider the centrifugal principles. This statement returns with preliminary evidence to the basic question: is there an emerging “maker” culture? It would seem that there is in Japan and following are some of its features.

I observed seven very different labs with different shades of purpose, different business models, and different machines. However, they share a charter and enact the values of that charter: open data sharing, education about machine skills and public access (among other values). The labs all have a laser cutter, a 3D printer, and some kind of milling machine. All the labs seem to favor creative exploration first and set aside commercial value as just one possible salubrious eventuality. When I asked one director about projects aimed at commercialization, the director responded: “well, I think we can worry about [making money] later.” Thus the core values (perhaps as defined in the charter) mark points of gravity pulling people together in intermittent connections but with impressive force of action.

I observed, as another example of commonality, frequent sharing of exciting news about cool “maker” projects from around the world. On Facebook and other web locations, “makers” keep each other current on such news. As another example, many people posted about Fab9, which seems to have been a useful centrifugal shared purpose.

Perhaps most striking to me was how the community seemed to cohere around one specific idea that they all treasure: the idea that “making” opens pathways to a better future. They see the potential, quite sincerely and fervently, in my observation, for power to return to people through fabrication. An excitement about the potential to change existing institutions is perhaps the most

centrifugal shared principle at work in the “maker” community in Japan. There are many other activities that the directors and patrons of FabLabs could undertake with their skills, especially considering that most lab activity hardly carries commercial value. Yet I came to understand their sense of a new possible future as perhaps the primary customary pattern or centrifugal principle.

The word *mirai* appeared consistently in “maker” discussions online, on articles about fabrication, in my interviews, and on the cover of Hiroya Tanaka’s widely read book. *Mirai* means: the future. I made my first FabLab “things” in the lab in Sendai in early August 2013: a simple wooden puzzle with engraved cartoon characters and printed plastic pinwheels for my children. Doing so helped me understand much better, as the designs left my fingers and arrived in physical form through the machines, that a sense of power over the material world, a power formerly unique to large institutions, has been unleashed. The labs, in a certain sense, seem animated as shrines to the ideal of grassroots power and a vision for a better world.

### **Conclusions**

“Makers” in Japan are an emerging culture. I have visited seven existing FabLabs with an ethnographic lens and seen evidence of this culture and the subtle ways that new tools have opened new social pathways. With new tools people are energetically inventing and making new things and forming new social groups. Hiroya Tanaka told me that at least four new labs are likely to be opened in the next year in Japan. I expect to return in 2014 to study among the “makers” in Japan for my dissertation. With them, I look forward to seeing technical tools, associated with human agencies, nourish the tendrils of a new possible *mirai*.

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