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CYCLE TO DISCOVER NEW NEEDS

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Abstract: In recent years, owing to the widespread use of digital fabrication, spaces for creators, such as fab laboratories and working spaces, are increasing. However, it is difficult to discover new needs with such spaces alone. It is expected that, in order to explore the needs and to develop applications, by proposing consumers' lifestyles must be studied. "it is difficult to find deep needs in the structure that distinguishes creators from users" stated (Yukari & Shunpei, 2015, p. 40).

For investigating the use of a new technology called 3D printer, which has been used by a limited number of people to date, a 3D printer was installed in an open space of a shopping mall, accessible to ordinary people. The creator's investigation was conducted on this printer. We investigated the creators' needs discovered among them. The mechanism of user innovation was considered based on 3D printed products and cases of 3D printing.

Keywords: *Creativity Support, User Innovation, Digital Fabrication*

1. Introduction

The author opened a shop called "Ah 3D printer shop !!" (hereafter referred to as a 3D printer shop) at Nakano Broadway in Nakano, Tokyo. The 3D printer shop was opened in Nakano Broadway because it is a place that attracts more attention than AKIHABARA (Yusuke, 2014). In Japan, the most advanced culture is called "Sab-Cul" (subculture). Before developing into the main culture there is a subculture and there is a possibility that the subculture has a new culture before becoming the main culture in the future. Consider what will happen if a consumer sensitive to subculture with cutting edge antenna leading the next main culture experiences a 3D printer. Although a limited number of people have been able to use 3D printers to date, it is possible for ordinary people to use them to create any object in any quantity according to their wish. Thus, it can be thought that 3D printing technology will advance from an era in which unnecessary objects were produced in large quantities, but in truth I do not really know what will happen. "Fabricated: The New World of 3D Printing" (Hod & Melba 2013 p. 76) states that everyone can acquire a tool called a 3D printer, such as "Ants get a factory themselves," and free expression can be obtained.
"Democratization of Expression"(Homei, 2016, p. 98) occurred by allowing everyone to participate in a presentation place. It is said that the same will occur in the world of consumer-generated media (CGM). Currently, if one owns a PC, one can acquire cheap music production software for free and produce a voice that could previously have been produced only by a limited number of people. In this manner, we think of the same phenomenon as the possibility of innovation being expanded with the increasing adoption of technologies that could previously be used by a limited number of people. Chris Andersen

referred to bloggers' collective power as that of "Ants with megaphone in hand". It has been stated that the collective communication skills of bloggers surpass those of major media with the increasing popularity of the Internet. In the same manner, we considered that the innovation surpassing that of the mass-producing manufacturers at present can be realized in many ways by the fact that everyone can use 3D printers and general consumers can have factories.
As a general method of current needs analysis, there is a method of exploring the needs of products and services based on investigations typified by persona law etc. However, we believe that such a method is insufficient to realize personalized needs utilizing digital fabrication.
In "Social motive of Design" (Toshiharu 2015), we are paying attention to the function of the product and the social motivation in the place where it is expressed. It is written that personal motivation can be divided three types of personal motivation - Deducative Pre-design - Inductive Pre-design and Abductive Pre-design. In either case it states that personal motivation of the designer is a source of new products.
Based on this, I thought that it was difficult for the user's personal motivation to occur at a place away from the living space where the entrance was restricted, such as the membership system or where only a machine was set up and installed .

Figure 1. "Ah 3D printer shop !!"

2. Issues seen in the 3D printer store

The 3D printer shop is in an open place, and many of its visitors are ordinary people who arrived by chance. Almost all the ordinary people who see a 3D printer for the first time have the following three questions:

- What can we prepare using 3D printing ?
- Can you print 3D photos and illustrations ?
- Can I 3D print this thing ?

These questions involve many requests that cannot be handled by the current 3DCAD 3DSCAN technology and software, and hence, the software problem with regarding the 3D data creation necessary for 3D printing remains unsolved. As answers to the above three questions, when we say that 3D data is necessary for 3D printing, and data in the STL file format is necessary,

people generally realize the difficulty in creating 3D data, and we often recognize the great hurdles in using 3D printers. There are many cases where general consumers give up the use of 3D printers.
We research the percentage of requests for 3D data creation in the case where ordinary people are not able to create 3D data among all requests for 3D printing brought to a 3D printer shop in March 2016. It shows also shows the percentage of cases where 3D data were brought to the shop for creation. This survey indicates that less than 40% of the 3D printing consumers create their own 3D data, and the remaining 60% need assistance to create 3D data for printing. It can be seen that 3D data cannot be actually created. Furthermore, in the case where consumers sought assistance to create 3D data, we did

not include cases where the data creation was abandoned because the 3D data creation cost was not met. About 80% of consumers have their solve the problem with 3D printers, but they cannot create 3D data, more using the 3Dprint is a difficult with general consumers.

3. Cycle to discover seeds

First, a 3D print shop is defined as a space, and the place for daily life is defined as a field.
The first author of this article serves as the store manager. and Figure 2 shows the 3D printer shop as an open space where anyone can freely visit. At the shop front, 3D printers from each company are exhibited. The staff who can teach 3D CAD.

Figure 2. Space & Field

We summarized the movements of creators among the visitors who were investigated.

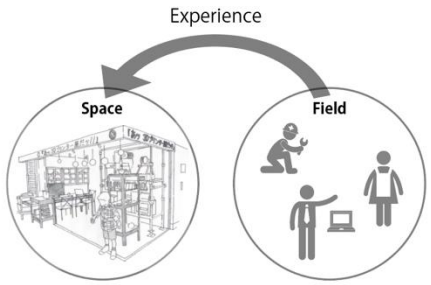

Figure 3. Make new experiences in space

Step 1. As shown in Fig. 3, creators visit the space from their own field.
While watching or touching a 3D printer, one understands what 3D printers are. By looking at what can be done with 3D printers and how other people are using 3D printers, one can experience a new technology such as a 3D printer, which one has seen only on TV. Thus, one can acquire knowledge of a 3D printer and become a creator.

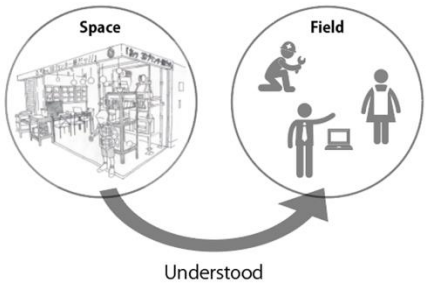

Figure 4. Understand and return to the field.

As shown in Figure 4, ordinary people who experienced a space for the first time in Figure 3 understand what 3D printers can make and eventually return to field.

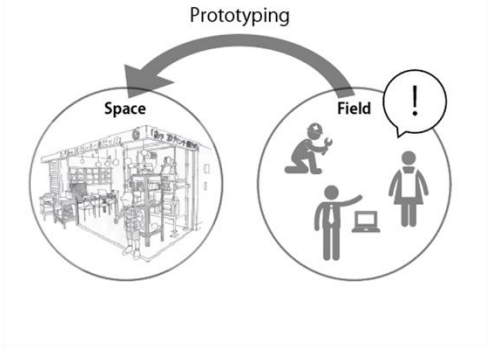

Figure 5. 3D data creation or bring your own.

Then, as shown in Figure 5, they noticed inconveniences in the field and discovered the need to solve them by 3D printing. This leads to the need for a space.

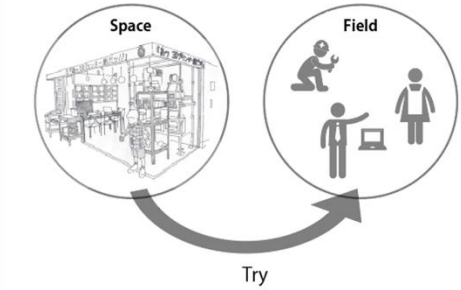

Figure 6. 3D data creation or bring your own.

As shown in Figure 6, they create a prototype in the space and try again in the field.

Figure 7. Products found in Field and designed by Space.

Figure 7 shows a design prototyped by a creator through the procedure shown in Figure 3–Figure 6. The left side of Figure. 8 shows the first prototype model. The right side shows the final design. There was a problems in the process of users discovering needs and making products.
there are technical problems and support problems. One of the technical problem is that, 3D dimensions created by a 3D CAD are not 3D printed as they are. The technical problems of FDM 3D printers exist because it is impossible to make fine details with more precision in the precision one coming out from the nozzle of 0.4 mm. However, the user thinks that the numerical value entered by the data of 3D CAD comes out as it is. Thus, there is a technical problem in a 3D CAD and 3D printer.
For example, there are many cases where the user designs a product with weak durability without noticing it. The product breaks on use, because of the parts that are not strong. Users may carefully design products if there is an alert function in 3D printing. Users have many problems to solve. You should be able to solve it by support. However, if one does not understand the problem, it is a big problem whether you can receive advice and support from someone who is nearby is a bigger problem. This support was done by 3D printer shop and thanked many users for their support.

Figure 8. Image to use

4. Consideration

In this manner, we identified the need in the field, prototyping in the space, and repeated attempt in the field. It is important to know how the idea travels between these two contexts in this manner. A creator follows the process of learning 3DCAD for the first time while consulting a 3D printer shop to solve a problem, performing prototyping several times, and ultimately solving the problem. Fig. 10 shows the moment when we completed prototyping with ordinary people. Figure 10 show the ordinary person who actually made it.

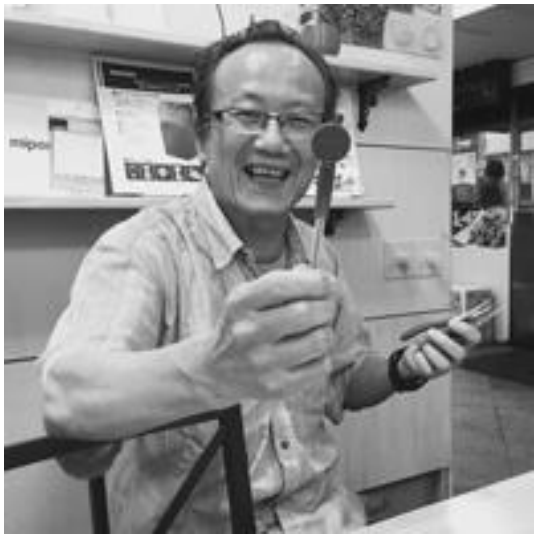

Figure 10. An ordinary person

In this manner, the process of solving problems tailored to individual needs was discovered. In this process, a cycle occurs in the open place where users can going to 3d print shop. In "Community of Practice", (Wenger, 2016) states that the community creates a social structure in order to learn. It is important to resolve the issues (2-1 issues seen in the 3D printer store) that appear while creators attempt to make ideas materialize in the user community in conjunction with 3D printer manufacturers and software developers. The community creates a social structure to learn. I believe that it is important to solve the problems appearing while general consumers attempt to make ideas materialize in the user community in conjunction with 3D printer manufacturers and software developers. In order to find yet undiscovered needs, it is considered important to go back and forth between different contexts of field and space. Irrespective of how good it is to have a digital fabrication space, it makes no sense. Moreover, irrespective of how good the equipment is, one cannot find the needs in the state that the creators are locked in. The need to be discovered by going back and forth between the contexts of space and field is important. We investigated the process of setting up a new technology (3D printer) in an open space and developing an innovative idea with creators. "the end user has not encountered yet, to understand the needs not yet clearly understood" (Norman, 2004) said; the new challenge in product design is a situation like that. The 3D printer technology is conceivable if it is innovative. However, the 3D printer has not yet been marketed, and hence it is necessary to create a new 3D printing market. Most important thing is involving ordinary people.
It is impossible to use only open spaces; the cycle to discover new needs will reveal more needs. It is thought that it is evolving at least in several situations. In the future, we need to study the timing at which more needs arise and the process that will embody it.

For example, I used a cycle to discover this need and made a design workshop to apply it to an actual contest. This contest is an idea contest that explores problems in everyday life and embodies it in 3D printing etc. In CYCLE TO DISCOVER NEW NEEDS, I found that I can find new needs from experience.I applied it to the contest. I noticed the needs of daily life in the design / workshop, sharing ideas and prototyping. After that, we supported 3DCAD as shown in Fig. 11.

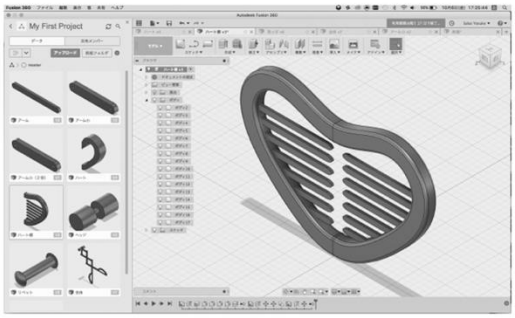

Figure 11. **Products with hair stoppers and combs coming out at the workshop were integrated. Figure. 12 shows the use of such a product.**

Figure 12. Example of use

The product that I actually made was highly complete; I was able to win the contest. I think that it is important to create a mechanism that can exchange ideas like this in our lives.

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