A New Perspective on Design Education: A "Creative Production-Manufacturing Model" in "The Maker Movement" Context

Xiang-Ming Zhong & Kuo-Kuang Fan
National Yunlin University of Science & Technology, Taiwan, R.O.C.

When "The Maker Movement" started, it made a great impact and influence on many aspects of society. The Maker Movement has transformed industries as well as people's way of life and thinking. For this reason, many people decided to create something by turning their ideas to tangible products. Media has become a bridge that connects people to each other and to reality. It is also a tool which controls relationships. "Efficiency" has been replaced by creativity based on the economic market model, and creativity links up with capitalism. The aim of this article is to establish a "creative production-manufacturing" process based on "The Maker Movement" context along with the relationship between "media-as-tools" and "creative production- manufacturing". The article also discusses how the media impact the "creative production-manufacturing" process as tools. Lastly, it presents the possibilities of interaction between a "creative production-manufacturing" model and design education.

Keywords: design education, creative production-manufacturing, media-as-tools

INTRODUCTION

Since the beginning of time, people have been creating things in their garages, basements, and workshops. However, "what distinguishes contemporary makers from the inventors and do-it- yourselfers (DIY-ers) of other eras is the incredible power afforded them by modern technologies and a globalized economy, both to connect and learn and as a means of production and distribution." (Hagel et al., 2014)

"With greater access to tools, training, and community, not to mention the technology-guided tools themselves that are less expensive and easier to use, the hurdles to creating are disappearing." (Hagel et al., 2014) In a sense, this

Correspondence: Xiang-Ming Zhong,
Department of Design, National Yunlin University of Science & Technology, 123 University Road,Section 3,Douliu,Yunlin,64002, Taiwan, R.O.C.
E-mail: 838167714@qq.com

phenomenon can persuade more and more people to transform their own ideas into physical products. It can even encourage people to join network-based associations and share their ideas with others.

From a product-oriented model to a consumption-oriented one, the world has leaned towards pursuing a value-oriented model. Countries with a traditional economic model have changed into mixed and market economies.

"Fertile farmland": An open context

In general, a market economy is always linked with capitalism. It is an economy in which decisions regarding investment, production and distribution are based on supply and demand (Gregory et al., 2003), and prices of goods and services are determined in a free price system (Altvater, 1993). The major defining characteristic of a market economy is that investment decisions and the allocation of producer goods are mainly made by negotiation through markets (Johnson, 2005).

Free economy and capitalism are not the same. People in a free economic system freely display their talent for themselves and for the community in order to create wealth that would modernize the economy. Economic modernization can promote joint, accelerated political modernization in all aspects of society. "Macroeconomic regulation and control" is necessary to protect the rules of the market and guarantee normal functioning of the economy.

State of the literature

- Described the creativity based on the economic market model, and creativity links up with capitalism.
- Discusses how the media impact the "creative production-manufacturing" process as tools.
- Establish a "creative production-manufacturing" process based on "The Maker Movement" context along with the relationship between "media-as-tools" and "creative production-manufacturing".

Contribution of this paper to the literature

- Establish a "creative production-manufacturing" process based on "The Maker Movement" context along with the relationship between "media-as-tools" and "creative production-manufacturing".
- Presents the possibilities of interaction between a "creative production-manufacturing" model and design education.
- Provide theoretical basis for further practical research of design education based on the maker movement and spirit.

"Irrigation" combines with creativity and media

Creative concepts have become the dominant framework in today's social and cultural policies, and the central element of information and sociological theory of innovation. Creativity can also be understood as an ideological construction. "Innovation and creativity are widely used terms in many national development strategies. The creative economy concept is derived from the innovation concept and combined with the concept of creativity which is based on creative industries. The creative industries concept in policy documents implies added value, exports, and new jobs, which are the bases of competitiveness." (Moore, 2014) The concept of creative industries was "first documented in 1994 in Australia when the government released its new cultural policy called Creative Nation, which was designed to help Australia embody new IT opportunities with a growing wave of global culture enabled by digital media." (Moore, 2014)

"The message of any medium or technology is change in scale or pace or pattern introduced into human affairs." (McLuhan, 1964) People have been living in a "global village" built with railways, airlines, and networks. At present, communities are joining associations. People who work in different areas get together in a place called "Maker Space". Individuals are linked by a network as they make things in cyberspace. Open source is the fuel of "The Maker Movement". "When we turn our attention to hackerspaces, we see not only a space experimenting with new sorts of fabrication tools, but also a community that reshapes the very meaning of technology innovation." (Lindtner et al., 2014) Whatever the network-based

communities or maker spaces are, they all focus on creativity and spreading the creative production-manufacturing model to society.

Technical democratization as "sunshine"

A new way to directly take creative ideas to market for testing is through crowd funding. Through this platform, an idea would be evaluated by people from all around the world. When an idea receives enough funding, the projects can strongly move forward. Aside from financial support, there are also various communities that get to appreciate the project.

When technologies (open-source, 3D printer, etc.) and communities work together, creativity spreads from government departments and large-scale corporations to the masses, and is centralized by an extensive network-based platform group which is also supported by crowd funding. Creative products and services reach the mass market gradually, and a new cycle begins (See Figure 1).

In Figure 2, "the participation scale" which was created by Jeremy Heimans and Henry Timms shows a "new power" which comes from the people's growing capacity and desire to go far beyond passive consumption of ideas and goods." (Heimans et al., 2014)

In reality, each separate section in the participation scale is connected and vital to the creative production-manufacturing process, which works perfectly. After shifting from traditional consumption, people has begun sharing contents or ideas through network-based platforms, such as Facebook. A large number of audiences have joined communities and built extensive platform groups. Aside from the masses, corporations and the government have also become involved; thus, dispersing creativity.
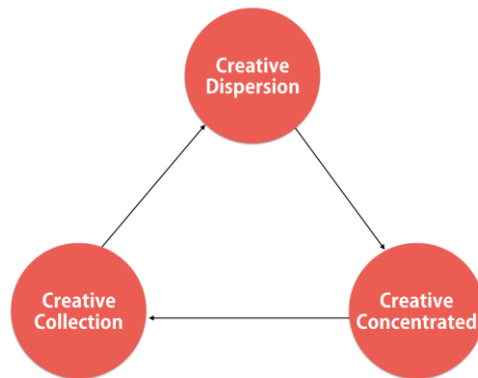
Figure 1. Creative production-manufacturing process
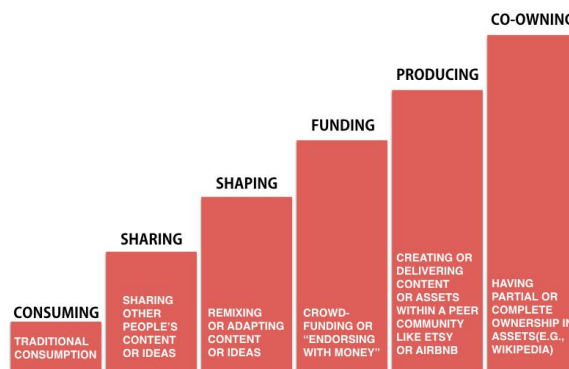
Figure 2. The participation scale

FROM CREATIVE DISPERSION TO CREATIVE CONCENTRATION

In the 1960s, Ellis Torrance conducted a major assessment on "divergent thinking", which was a question raised with many possible answers and not just the correct answer. Although these tests were widely used, researchers began to question this method from 1970 to 1980. During the 1980s, the study confirmed that personality test scores do not reflect a creative ability for detecting an actual situation affecting the subject. The former deputy editor of Business Week Bruce Nussbaum said that he has written many articles on creativity and innovation, and has visited hundreds of business, design and science leaders for 25 years. He discovered that creativity is a trait that everyone can develop.

"Innovation emerges from an innovation system. An innovation system refers to the rules and governance structure that empower a network of universities, research labs and firms that generate, acquire and disseminate knowledge." (Spualli et al., 2014) It is apparent that creativity is centralized using an innovation system. After Braverman fixed the historical trajectory of capitalism, he found new forms of management in work processes, such as increased management control technology that reduces the creativity of the labor force and causes work fragmentation, as well as worker deskilling and degradation. The principle of creative dispersion is necessary. The origin of creative production-manufacturing should be released from "efficiency".

Intelligence and creativity are constructed differently and subjected to varying theoretical and psychometric development (Kaufman et al., 2011). According to Dr. Teresa M. Amabile of Stanford's psychology department, each area has its own experts, and these experts have a particular perception and operation in which creativity still depends on some domain knowledge. People who work from different areas, have different skills. As cognitive scientists have discovered, people inevitably create new ideas from previous knowledge and experiences. In other words, in a social and cultural point of view, people must act in a social context in order to be creative. Creative intelligence represents social nature. We can promote our creative ability by learning, cooperating and sharing with others.

Network-based communities as the "blueprint"

David Kelley from Stanford University's School of Design said that in today's world, you need two abilities for competing. One, you need analytical skills and tools. There is also a need to create using these tools. Several leading corporations and researchers were interested in the use of group support systems (GSS) to enhance idea generation. Group memory is a key component of the GSS- based idea generation process. Through empirical studies, results show that individuals generate ideas that match the paradigm-relatedness of ideas provided to them as stimulation (Satzinger et al., 2008).
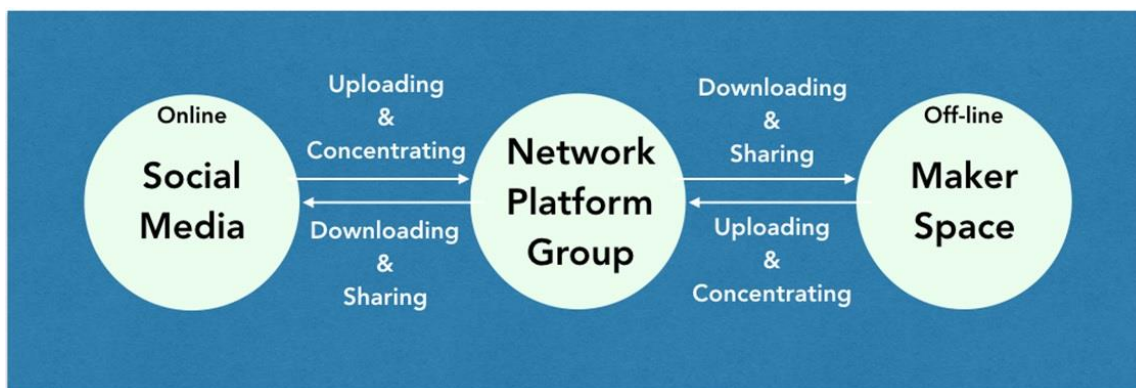

Figure 3. Network based communities as the "blueprint"

Creative development depends on the creative environment. A creative environment impacts the development of the creative production-manufacturing process. A social system is composed of social formation, superstructure and ideology. The construction of the creative environment should follow these three guidelines in promoting democracy, developing market economy and advocating freedom. A social system is a platform similar to a creative environment. With a long history of open source, it changes a lot in terms of aspects from industries to individuals. It also has broader implications for organizations and technology. With the maker movement, open source is an act of "opening the door" of democracy in the network, with a 3D printer as the tipping point of the maker movement.

The blueprint is drawn by social media online while maker spaces are drawn offline. Communities cooperate, discuss and share ideas with each other.

## FROM CREATIVE CONCENTRATED TO CREATIVE COLLECTION

Social media platforms are websites that allow users to create and exchange content using Web 2.0 technologies. Over the last few years, social media platforms have become increasingly popular (Putzke et al., 2014).

Previous research has noted that communication is one of the most basic tools for supporting organizational change (Kotter et al., 1979). Not only do individuals use social media for communication, sharing and exchange of ideas, but many companies have also added social media as another outlet for external and internal corporate communication regarding sustainability. Real-world social relationships have moved into the virtual world with online communities bringing individuals together in a "village". This phenomenon allows individuals to share knowledge, entertain one another, and promote dialogue among different cultures.

Network-based platform as a "workbench"

By laying the blueprint on a "workbench" based on network platform research, investigators changed the "diffusion of innovation" theory to a growth process with accumulated user scale. The growth process is shown as an S curve. In the beginning, users who were willing to adopt, presented a lower rate, and developed slowly. In the period of development, a number of users are showing a fierce rising trend and the number of users decreased and slowly developed again during the maturity period.

In the "diffusion of innovation" theory, innovators were the first crowd that joined the network platform, which is the area on the left side of X. The S curve of points X to Y meant a lower rate. In exploring network effect, it was found that more
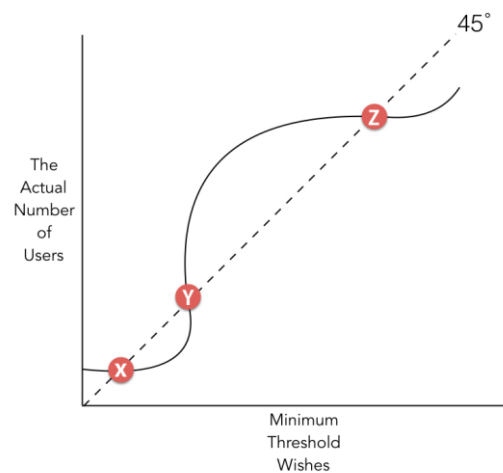
Figure 4. S curve of "The actual number of users" and "Minimum threshold wishes"

and more people were attracted to the "same-side network effect", which means that in the areas of X to Y, the crowd interacted with people close to them such as families, friends and colleagues. This close relationship reveals the similarity in their cultures and societies. In the area from Y to Z that shows the explosion of network effects, there is a faster developing zone of network platforms. For the cross-group network effect, people from different cultures and societies fill in this area where creative concentration is the direct focus.

CREATIVE COLLECTION BACK TO CREATIVE DISPERSION

Crowd funding provides a really powerful channel for newly established companies, groups, and even individuals. It is the practice of funding a project or venture by raising monetary contributions from a large number of people, typically via the Internet. "One early stage equity expert described it as the practice of raising funds from two or more people over the Internet towards a common Service, Project, Product, Investment, Cause, and Experience" (Drake, 2014)

Crowd funding is a network-based platform with great responsibilities in creative collection from all over the world. When a project is able to get enough support from crowd funding, it partly achieves success. At the same time, major industries, government agencies and civilians can provide financial support and take part in the project, as well as gather creative ideas and produce something new.

Crowd funding establishes the nature of a relationship. Funding comes from different people. When crowd funding is completed, it is important to establish a platform using social media tools. People who provide support want to be kept updated on the project or product in real time. Keeping in touch with supporters by giving feedback and comments is necessary. After which, a community is formed to promote and maintain the sustainability of the whole creative production-manufacturing process.

CONNECTIONS AND OPERATIONS IN DESIGN EDUCATION

"Media-as-tools" rely on the cycle of the creative production-manufacturing process. They link all components closely together and influence the marketing of value-oriented products and services (See Figure 5).

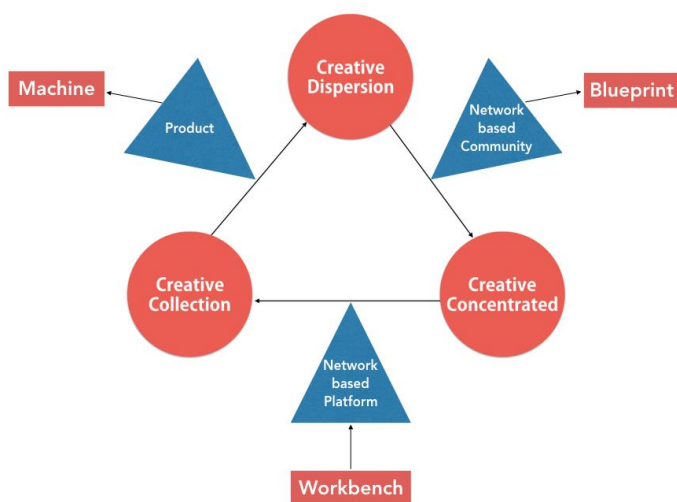When technology broke through the structure essence from 0 to 1, for a long

Figure 5. Model of creative production-manufacture process involved media

period of time, the design constantly repeated "transform" from 1 to N. Most of today's design education established the ladder "parallel" to the industry and transferred corresponding skilled "workers" to industry, but ultimately failed to achieve "parallel" state. In order to conform to requirements of industry and trend of market development, the employment problem affected the school for a long time, especially the system of vocational and technical schools and professional courses, as well as the talent training forms and methods, students are exploring the "intersection point" on the "parallel" ladder, but the "intersection" is often N + n, so the chance mainly comes from their own businesses while the N equals to 1. The design education is controlled by development of industry over a long period of time, which presented the status that development of industry leading development of education.

## Creative originated place: the necessity of elementary education in design

In terms of the modern design education development situation, it is easy for design to "transform", but lacking of innovation ability leaded by creation. With the development of technology and sensitive to people's needs, the design education should fusion technology in its own development, not only as a tool to use. It is extremely urgent to find a path for design education reform, which will not waste education resource and distribute faculty reasonable, and put the innovation "landing" and responsible for society.

Generally colleges and universities with design major have set up specialized courses for use of professional and technical tools, and let the students have opportunities to practice through the introduction of actual project, and with solid skills, they were full of unlimited expectations for society and enthusiasm of involved in the industry actively. The design is regarded as a skill and a tool by society "for a reason". The contempt and ignorance towards society, "Rectification of name" (prove) should be done by the design education. Design was a kind of method and a duty. This method will be effectively used only in master the principle of design and historical development of context and only in this way to look upon the design, the heavy responsibility bearing by design could be felt. Students should be prepared for the maker movement in the elementary stage.
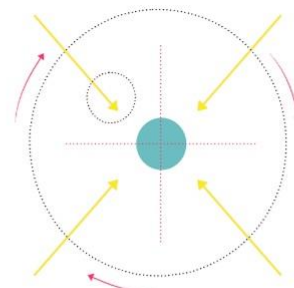
Construction for communities and platform

When the body cannot satisfy with the desire for knowledge and the efficiency of hunger, the help of a "variant" is needed, and a person who was able to control it is also needed at the same time. How to dominate or just operate are both related to the education. Operation, only about skills and disposals, is the "trio" (Cooperate

Creative Thinking
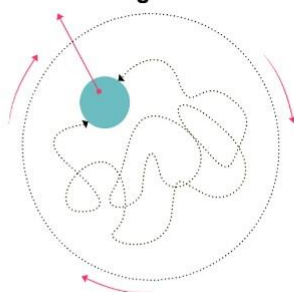
The Track of Creative Thinking is Disordered   Driving the Creative Thinking into the Right Position

Figure 6. The activities of creative thinking

with each other) of the basic theory, development history and practice. In the development of real society, the transformation and development of industry abandoned the "workers", and scattered them to condition of making a living by selling labor, and their "useless" skills were dispelled in the meantime. Education saw the incredible speed at which the science and technology create capital and huge gap of market demand, and ignored its side effects, namely the high drop-out rates. The generation of this kind of condition was derived from the collusion between demand of market and the capital operation mechanism. At this point, the creative, which was above knowledge and technology, has been repeated again and again. Then the education cultivated students' creative ability immediately through various means, and also accepted baptism of creative itself.

As our technological society continues to change and advance, new challenges and emergent phenomena will be the rule. Students should be adequately prepared to face the chaos and complexity of the world rather than shy away from it."(Kelly et al., 2008) The rapid expansion of the network community made communication filtered fear and shy of students towards teachers. Promptness made communication more smoothly, crossed distance barriers and saved time.

The market is more inclusive and ruthless than imagine. It is playing the design education rights, but could not resist the equality required by the democratic; it manipulates responsibility of the design education, but could not suppress the fair emphasized by competition.

If a project or a product was chosen by masses, it presents the masses' identity and the attitude of this project or product. "The identity of masses was deeply connected with consumption" (Sparke, 2012). For the purpose of design education leading industry development, the changes in the masses' ideology is necessary and upgrade the source of design education process is the new way for reaching achievement of "large design" ecosphere and get rid of industry's obstruction.

Sustainable and positive working on creative production-manufacture process model

Multivariate environment and democracy and open competition might not only make the learners' creative ability promoted, but also change the world in turn with the responsibility of design. The development of technology provided a platform for design, dispersed right of design involvement to the masses, which make the design had right of fair competition in the educational environment and accept the market inspection, namely the design education environment and the market is synchronous and accepting the challenge and test from market.

There is an opportunity that may make the ecosphere of design getting better. Referencing the mature business model of crowd funding like Kickstarter, design education can suit for it, draw support it and upgrade the present design ecosphere. Education can getting involved in commercial activities, get investment and be tested. More and more students are turning to Kickstarter raising funds to complete their dreams, and this dream is growing up in "fertile soil". This environment is owned by the school education and which has ability to provide.

CONCLUSIONS

According to previous studies, everyone has a creative ability. With discussing the status of present technology democratization context, technology has brought convenience to people, but also offers the possibility of turning people's creative ideas into physical products. After shifting from traditional consumption, and supported by the participate scale, people has begun sharing contents or ideas through network-based platforms. Crowd funding establishes the nature of a

relationship and it is important to establish a platform using social media tools which can maintain the sustainability of the whole creative production-manufacturing process.

The creative production-manufacturing process enables collaboration and proliferation of concepts that provide strong creative resources and momentum for the development and transformation of the industry.

As a successful product, Pebble smart watch which based on the open source technology, then their creative was concentrated by group members' collaboration and interaction. Not only the Pebble smart watch pushed their creative to the physical, also developed into mass manufacture. The stable customers they had, the stable market they own. With huge customers supported the Pebble smart watch, the customers can downloading apps on their watches, further more, the open SDK allowing them customize their own apps and running in their watches. All these people were collected the creative from the product of Pebble smart watch that can create their own values and promote new technologies in mass market.

By focusing on the future development and transformation of the design industry, design education which stands at the forefront of such development, also needs to change with the times. A midst the changing society and social media explosion, the model of a community-based and network effect can easily explore and promote creativity. More interaction and communication take place online using different types of network platforms.

When makers offer their ideas in crowd funding platforms, they can receive funding from the masses and their products can also be tested in the market. With the current market economy, a creative production-manufacturing model can completely accomplish the task and help people create value depending on their creative production-manufacturing experience as well as promote a value-oriented concept.

In future studies, we hope that the creative production-manufacturing model can make a empirical study to design education based on the maker movement and spirit.

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