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MAKER MOVEMENT'S EFFECTS
ON THE DEMOCRATIZATION OF DESIGN PROCESS

GRADUATE THESIS

BURCU ÇELİKSAP

ADVISOR: ASST. PROF. DR. ESER SELEN

ISTANBUL, SEPTEMBER, 2017

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"I, Burcu Çeliksap, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis."

The thesis of Burcu Çeliksap

has been approved by

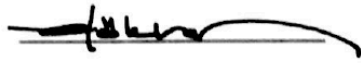Asst. Prof. Dr. Eser Selen (Advisor)   Kadir Has University

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ABSTRACT

BURCU ÇELİKSAP, MAKER MOVEMENT'S EFFECTS ON THE
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This thesis examines how Maker Movement democratizes the design process by focusing on technologies and tools used by Makers. The Maker Movement has formed by people from different social-economic groups gather to create new jobs, innovate by accessing the open source tools of production. The discourse of the Maker Movement is on the political spectrum because of its contents such as knowledge exchange, manufacturing, using technology and tools ushering "the new industrial revolution." (Anderson, 2012) The study explores questions such as how society involves itself in this movement? How people communicate and transfer their knowledge? How do the effects of Makers Movement effects on society engagement change the economic structure within society? Lastly, how can the new tools for design process in Maker movement be democratized and the roles of designers in this movement? The context of this study invites us to embrace the humanist implications of interaction with technology in the contexts of production, design process, content sharing, accessibility to the tools of production, creating small businesses and access/hack of materials utilized and having a vision towards the future of Maker Movement. Maker Movement and the Maker Community might shine a light on our formal values, ethics, and communication as this study is an ongoing project since the Maker Movement is happening now and is developing and growing every day.

Keywords: Do It Yourself (DIY), Maker Movement, customization, making, tools, community, Fab Lab, Maker Faire, design, design process, democratization

ÖZET

BURCU ÇELİKSAP, MAKER HAREKETİ'NİN TASARIM SÜRECİNİN
DEMOKRATİKLEŞTİRİLMESİNE ETKİLERİ, YÜKSEK LİSANS TEZİ

İstanbul, Eylül, 2017

Bu tez çalışması Maker hareketinin tasarım sürecini nasıl demokratikleştirdiğini, Maker'lar tarafından kullanılan teknoloji ve kullandıkları üretim araçları üzerinden incelemektedir. Maker Hareketi içerisinde farklı sosyo-ekonomik gruplar bir araya gelerek, yeni iş alanları oluşturmakta, üretim araç gereçlerine açık kaynaklardan ulaşarak yeni inovasyonlar ve yeni tasarım sürecinde metotlar gerçekleştirmektedir. Maker hareketinin söylemi, bilgi alış-verişi ve ulaşılabilirliği, tasarım süreci, teknoloji ve üretim araç gereçlerinin kullanımını içerdiğinden politik bir spektrumda anılmaktadır. Bu durum aynı zamanda Maker hareketinin "yeni endüstriyel devrim" (Anderson, 2012) olarak anılmasında da sebep olmuştur. Bu çalışma, bireylerin ve grupların toplumlar içerisinde kendilerini bu harekette nasıl konumlandırdıkları, nasıl iletişim kurdukları ve bilgi alışverişi sağladıkları, Maker hareketinin toplumda nasıl bir değişiklik yarattığı ve bu değişikliğin ekonomik yapıyı nasıl biçimlendirdiği gibi konuları incelemeyi amaçlar. Son olarak, Maker Hareketi'nde önemli rol oynayan üretim araç-gereçleri tasarım süreci kapsamında nasıl demokratikleştirilebilir ve tasarımcıların Maker Hareketi'nin tasarım sürecinin demokratikleşebilmesi için ne gibi rolleri bulunmamaktadır? Bu çalışma üretim, dizayn süreci, içerik paylaşımı, üretim gereçlerine erişilebilirlik ve küçük işletmeler yaratma bağlamında teknoloji ile etkileşimin hümanist etkilerini benimsemeye ve Maker Hareketi'nin geleceğine yönelik vizyona sahip olmaya davet etmektedir. Maker Hareketi ve Maker Toplumu, bu çalışmanın, Maker Hareketi'nin şu anda gerçekleşmesinden, her gün gelişmesinden ve büyümesinden dolayı, halen devam eden bir proje olması sebebiyle, resmi değerlerimize, ahlakımıza ve iletişimimize ışık tutabilir.

Anahtar Sözcükler: DIY (Kendin Yap), Maker Hareketi, kişiselleştirme, toplum, Fab lab, Maker Fuarları, tasarım, tasarım süreci, demokratikleştirme

Acknowledgements

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I. Introduction

The Maker Movement represents a technology-based extension of the "Do It Yourself" (DIY) culture that focuses on learning and utilizing practical skills. The movement fosters the application of these skills creatively as outputs while advocating for open-sharing access to goods, services, data, and talent.

The Maker Movement is simply a result of making and creating communication tools individually or collectively which is accessible to the masses. It is a grassroots subculture that enables engineering and innovation with arts, crafts, and design on a global scale. Maker Movement is active in democratizing the design process by the tools of production and education. By democratizing the making process, the movement aids individual based developments to get to market, while transforming the ways to educate the next generation of innovators, designers and the political and economic structure of today's world.

In his *Makers*, Chris Anderson writes that everyone is a Maker and was born that way. He explains it by giving examples of children who draw, plays with Lego's or blocks, and continues claiming that for many of us have hobbies or do things we have passion. He refers to examples from cooking, sewing, beading, etc. many of which are the hobbies or activities makes us Makers. (Anderson, 2012). Anderson's view of the Makers plays a significant role in this study particularly in understanding how the Maker Movement has been flourished and expanded worldwide, which is the very core action that created the Movement. Perhaps, today, Maker Movement's effects can be seen on the political spectrum because of its contents such as information exchange, manufacturing, using technology and tools which usher the user in "the new industrial revolution" (Anderson, 2012: 13).

Computing and communication tools have become smaller, and their functions have converged over the last century. These changes made possible that new technologies help users to achieve common tasks faster and accurately while amending the ways of how societies and individuals communicate and interact with each other. (Newson, Sugget, and Sudjic, 2016). People from different social-economic backgrounds tend to come together to create new jobs; innovate by accessing to the tools of production for open source.

The Maker Movement, however, is not just about utilizing technology and "Makers" are not limited to the tools that technology bring. The Makers' workbench can consist almost anything and does not require technological expertise. People are already genetically wired to be Makers. (Anderson, 2012)

1. 1 Aim

This thesis is an interdisciplinary approach to examine the effects of how Maker Movement could democratize the design process. It focuses on why "Maker Movement" is called a movement while requiring an understanding of the tools and technologies used by Makers. The study illustrates how the society involves in this movement through analyses of Makers' communication and the ways of transferring knowledge and skills. Since the society's engagement changes the economic structure, the question of how to negotiate with the political powers' control the access to the new tools of democratized production is discussed.

To discern how Maker Movement is democratizing the design process we should understand the movement's historical background and analyze it in relation to today's social, economic, and technological conditions. By understanding how Maker Movement democratize design process, this thesis will be expanding on the limitations of how most technology users have little or no control over technology and can only use it at its best function for every member of the society. In return, the utilization of technology can create change in the margins where production and utilization are seen separate.

The Maker Movement and the Maker Community could shine a light on our nominal values in ethics and politics. Therefore, this study also provides an opportunity to embrace the humanist implications of interaction with technology in the context of tools for production, content sharing, and creating small businesses through open access and sometimes white-hacking of materials Makers' use, which is a provision for the future of the Maker's Movement.

1.2 Objective

To achieve the evolution of Maker Movement the thesis focuses on historical timeline of Maker Movement from Industrial Revolution to the transformation of digital explosion, technologies, and tools that Makers use. Several questions aid in exploring the evolution of the movement such as what kinds of qualities do a person should have to be called as a maker? How does society involve itself in this movement? How do Makers communicate and transfer their knowledge? How does the engagement change the economic structure of the society and business models? Lastly, how can the new tools for design process in Maker movement be democratized and the roles of designers in this movement? To fully appreciate the effects of Makers Movement we should initially understand the need for a democratizing in the design / making process in the socio-political and economic structure of today's world, which the movement lays the groundwork to transform.

1.3 What is a Maker

The term Maker was first coined by Dale Dougherty in 2005 when he launched the magazine *Make* which focuses on DIY (Do It Yourself) projects involving computers, technology, electronics and handcrafted designs with other related fields. A year after the magazine was published; an annual public event was launched to celebrate tech-influenced DIY community. Currently, an estimated number of people are participating the movement in more than 50 countries via online, Maker Fair and Fab Labs. (Figure 1.0).

Considering the launch of the *Make Magazine* in 2006 as a catalyst for a tech-influenced DIY community, the movement has gained identification as Maker Movement. Since then the Maker Movement has been gaining momentum while Makers started to create their ecosystems within existing markets by developing an array of new products and services including the blend of smart producers and creative advancements such as Arduino and personal 3D printing. Throughout the years, the Make division has associated with Maker Movement and groups who are within the movement are growing every year.[1]

1.4 Maker Movement

According to Chris Anderson, the Maker Movement is now scaling up to create a new manufacturing entrepreneurship, and it is taking its place to be qualified as the new Industrial Revolution of the 21st century. (Taylor, 2012) The Industrial Revolution is a pivotal point which the society had transformed into a divergent system in which the industry and manufacturing are controlled. The significant changes in manufacturing, technology and their effects on the social and economic conditions are directly related to the industrial revolution.[2] Since the Industrial Revolution, the power to make things belonged to those who own the means of production, which were the big factories and companies and the mass market goods for which they built.

Firstly, the emergence of digital tools for design and manufacturing has landed now on desktops; and industrial tools are now available sizes and affordable prices. The tools of production have become digitized rapidly so does the designs. Secondly, these rapid changes enable users/maker to be able to share the product online with ease in turn for a creation of collaboration by digital means. Thirdly, the access to tools and materials for production has become more accessible. People can order materials online in variable quantities and produce personalized items, or they make mass production which they share in online platforms. The physical goods are created with the digital innovation model which is called the Maker Movement is in opposition to the line of production of the 19th and 20th centuries' creations of big business and the mass media. Therefore, Maker Movement can be defined as an integral part of the digital revolution of the 21st Century.

Regarding the technologies used through the Maker Movement, the most revolutionary aspect is that the previous tools and technological tools have become computerized and made available for everyone in the society.[3] Therefore, the design process has also changed significantly. New Makerspaces, tools of production, open sourcing, access to information and sharing are some of the elements which effect the changes in a design process. The term "democratization" in this study is used to analyze and explain the effects of free – open sharing, accessing to information and tools of production and enabling everyone to "make" without separating by education, gender or age. Almost in every maker space, one can access to the instruments of the production. The lists are ever-growing: from glue guns to 3D

printers, laser cutters and Arduino micro controllers to fabrication tools. All sourcing parts can be found online, which also serves in using them in online communities. Thus, the tools of production are democratized. Maker Movement is creating an opportunity of a hybridization of digital and face-to-face community interaction where individuals are empowered using these instruments and technologies, enabling to build new jobs, innovations social-economic challenges.

Another subject that should be analyzed in Maker Movement is the impact of the Maker Movement role in the society. The study elaborates on this impact in three parts; first the knowledge exchange, secondly DIY (Do It Yourself) and Maker practice and lastly customization.

1.5 The Making of the Maker Movement

The exchange of information among ordinary people are changing the processes of learning and the ways of how political actions operate, while individuals are banding together via the Internet and social platforms rather than waiting for institutional changes. Maker Movement's stance also aims towards taking power back from the control of large enterprises as both individuals and community by trusting each other to share the power/knowledge (Foucault, 1980) to create, learn, grow and solve problems which are indeed political. Foucault explains power/knowledge as the exercise of power is everywhere and enshrines it in social assumptions, technology, and cultural codes. He implies that in societies there is an invisible power/knowledge. Politics is not just about elections or controlling the power but the ways to create platforms for the negotiation of power.

Maker Movement is about sharing ideas and enabling access to solutions with the world, not for money or controlling other people but by giving a space of admission to anyone democratically using tools and production. And there are no institutions that can operate this power. It has the potential to form or revitalize communities and change the way both Makers interact. According to John Hagel (2014), the distinction at this stage is that Makers begin to connect with others for their expertise whether by joining in teams around ongoing projects or they just ask for their help and experience. From that point, some of them contribute to existing platforms, and both they unleash inside that community their creativity and express themselves freely.

With the Internet, the form of connectivity of communities which share common passions and ideas have changed, and the importance of physical location has lost its importance for creating these communities. Makers can connect and get engaged within small communities by mutual interests, even from different geographical regions that none of which was possible before to the outsiders or newbies.

1.6 The Inclusiveness of Maker Movement

The Maker community has started to arrange skill pools for technical solutions like how to use a 3D printer or how to write code. They meet on various digital platforms, or if they are in the same location, meet face to face to share the work or product. The important part here is that the notion of being an expert is not categorized under academic level or job titles but with interests and projects that have been created which also creates a democratized approach in the ways of communication. And Makers start to connect with each other both digitally and physically.

As makers get more connected with each other and get involved in events and activities as a community such as Maker Faire's, the possibilities of discoveries, new marketplaces and new ways to produce their inventions eventually rise.

Makers are recognized by their creative minds, resourcefulness and their ability to create new solutions and innovations. Most of the Makers use new technologies to merge their creativity with new solutions to innovations. Being creative is imperative for creating new solutions to problems both old and new. As we move into times of constant change, the workforce will be required to align themselves with Makers to stay competitive. If the resourcefulness and ability of Makers are utilized in line with the ways, the movement manifests it will eventually reshape the workforce positively.

For those who lean to the right in the political spectrum, the movement is representative of good old-fashioned economic values and entrepreneurial individualism.[4] For progressives, the Maker Movement and its "hackerspaces" and "maker spaces" — workshops with tools of production and technology like 3D printing for engaging in making and empowers by uniting individuals. There are

two views to Makers. The first view is that for those who defend the natural law, social orders and hierarchies the Maker Movements is just an activity which some individuals create crafted products and sell them and be part of small markets. For the progressives, however, it is a movement which creates its binding community, organizations such as maker spaces which bring people together under the umbrella of Maker Movement. These elements that enable empowerment such as maker spaces, hackerspaces, maker fairs, workshops, etc. does not mean that they do not have kernels. While the movement embraces an apolitical approach, it does not eradicate individualistic values that may or may not register to dominant public opinions.

The rhetoric surrounding the Maker Movement is shot through with cases that hold up individual production as a comprehensive, decentralized, noninstitutionalized mechanical framework. As Anderson, puts it in his manifesto on the subject, "people can become a virtual micro-factory, able to design and sell goods without any infrastructure or even inventory; products can be assembled and drop-shipped by contractors who serve hundreds of such customers simultaneously" (Anderson, 2012: 13). What we understand here is that now micro-factories make everything from bikes to cars as in the 20th century big companies were manufacturing cars while small companies were manufacturing bikes. Manufacturing often registers as a hobby instead of a job because it will have no financial security or certain work hours. But the idea of micro-factories surfaced today, for instance, three guys with laptops can collaborate on a project to create a start-up which may turn into a big company.

The Maker Movement does not introduce a *new* for a decentralized, democratized world. On the contrary, the movement serves the tools and technologies to the public that are hidden in inside the big corporations and large enter prices. The Maker Movement also grasped the significance of the changes in economic activity very early in its understanding all the while the economic activity turns into a life activity. In the capitalist economic system, those who sit on the top of the seat in the hierarchical system rules the economic system, and they are the decision makers. (Marx, 1984) Can Maker Movement change the hierarchical labour system? More likely, it becomes further because of it asides the labour issues.

Maker technologies reveal the actual labour and costs and share them with the public, and the good side is that it is shared globally and it is free. Today, people are more outgoing to create new solutions and innovations to everyday problems or needs which help to increase DIY tips, hacker ideas, and design projects. Be that as it may, what would happen if this turns into the basis for another economic advancement program? To be more precise, what advancements the economy will be seeing if everyone can access to the tools of production easily and be a part of an economic structure with its products individually?

With decentralized Makers, the problem to reach the good and access to the tools of productions can be easily reversed. Makers should be engaged in production and manufacturing.

Moreover, Maker Movement reinforces and strengthens political-economic ideologies through personal fabrications.[5] Makers can easily make/design their personalized items by connecting to hackerspaces and by just firing up the 3D printer. This even can turn to a lifestyle: Because of the maker community, you don't even have to have all the skills or talents.

For many people, those who write books and give TED talks[6], for instance — the movement is also about freedom and rights.[7] Because, it questions the access and privileges an individual can have based on the systemic structure, government system or class, race – gender subjects. Primarily, the women's rights to access to the tools of production are discussed in the last year's Maker Movement's agenda.[8] And as the Maker Movement spreads to the developing world — with Maker Fairs springing up in more than 50 countries now — this may change the view of the capitalist structure in Western economies.

The enthusiasm to Maker Movement by the White House represents how the Makers and Maker Movement can be joined in social life and economics to extend its potential. Maker Movement's effects on economic growth the President of the United States, Barack Obama claims, "There's real collective democratic freedom to be gained from the Maker Movement. But it needs to shake off simplistic economic individualism and hyper-capitalistic politics if Makers want to represent a disruption of the current economy" (Obama, 2014). To make it sustainable and efficient in the democratization process, however, what the Maker Movement needs is to get a firm grasp on social perspectives of the innovations'

potential — and to see it through while situating the movement toward peopling which can accomplish more than simply play with instruments and make customized schlock. (Wakefield, 2012)

Since its first launch, the Maker Faire, an event first created by *Make* magazine in 2006 which celebrates DIY (Do It Yourself) mind-set, science projects, arts and brings Makers together is growing every year. Analyzing the number of attendees to Maker Fair's chart (Fig. 1.0) the most attended is in 2013, a year before White House represented the importance of Maker culture. The Maker Faire was first launched in 2006 in Bay Area, and every year approximately 10K more attendees are taking place in the Maker Faire.
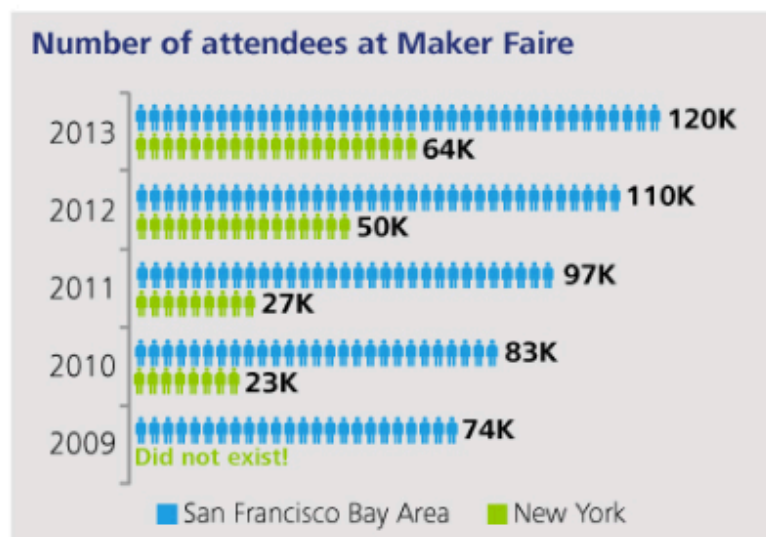

Figure 1.1, *A movement gathers mass and momentum*

1.7 Chapter Breakdown

The study is divided into three main sections with the aim of analyzing the concept of Maker Movement with an examination of the recent history through selections of key examples from Makers.

Following Introduction, the study elaborates on Impact of Maker Movement to the Society where it starts with Gerrard Gabb statement on Maker Movement in Chapter 2. The aim is to understand how the society transforms into a productive society via communicating and sharing through the Internet and open source referring. It continues with Henseler and Fenlon's claims to explain how technological advancements affect the members of society in the production line. Through examples of product designs made by Fab Lab's and Osman Koç's 3D printed prosthetic arm project, I explain the motivations of Makers and type of Makers quoting Mark Frauenfelder. Through the analyses of Kuznetsov and Paulos works sharing and learning concepts in maker communities will be discussed. With Bager Akbay, one of the co-founders of Istanbul'47 maker space we discuss the importance of maker spaces and education. We also see maker types, which is identified by PSFK Labs and Intel. The chapter ends giving examples from the United States support to Maker Fair's and Maker communities from Turkey like Atölye İstanbul.

The third chapter focuses on the customization and the use of democratized tools of production. In this chapter, we see drawing from Ashdown on democratized information – how the Internet is used as an open source information center. Starting with Anderson's idea "the new industrial revolution" (2012) and the chapter explains democratized tools of production referencing to David Owyong. By the democratized tools of production and as Dale Dougherty claims new technologies which can be used anyone who wants to create we focus on why customized products play a significant role and motivate the Makers.

The fourth chapter discuses the impacts of Maker Movement in economics. Through an analysis of "European Union Policy Paper 2015", the chapter focuses on three measurements assembling around the issues raised in this paper.

2. The Impact of Maker Movement to the Society

Maker Movement could revolutionize society, and its effects will flourish many sectors. According to Gerard Gabb, this revolution will be appearing through DIY, open source sharing, mentoring (Fab Labs, Maker Faire's), playing (Minecraft – coding), and exploring and risk-taking (new business). Maker Movement has already started to transform society through educational integrations such as teaching to code to the primary school students. The greatest results of this influence will be seen when these students graduate and become productive members of the society. The biggest impact here will be that these graduates will not only produce and create products for the use, but they will also be able to critically consider how, where and why its use, and its role and value within their societies. And that will be the ultimate result of the Maker Movement. (Gabb, 2016) As a result, design thinking has started to be educated in the schools in early ages.

The most powerful effect will be seen in higher education where DIY culture is currently embedded in the integral parts of their processes in the United States and Turkey. Today, in Turkey, maker spaces like İskele'47 providing education of coding to children and teenagers from kindergarten to university students. Integrating DIY culture to education helps students in self-efficacy and creativity. More and more communities grow in many countries and associate with schools. Students come together with these communities like maker space, maker fair, and online platforms and share, develop, mentor, explore with this DIY culture.[9] Bager Akbay explains in his interview, that only this year in 2017, there was over 50 educational maker fair events in Turkey more than in 15 cities from Adana to İstanbul for free. However, he also points out that unfortunately there are still problems with understanding the Maker culture while trying to organize a maker space or event. Most of the school/universities have now FabLab's and all the technologies like 3D printers in high quality. Their accessibilities are very restricted. The main idea of the Maker culture and movement is that it has to be free or low cost. So, here it is important to create open spaces without limitations rather than putting all the high-quality tools of productions behind closed doors.

To make design process democratized, we can say that one of the crucial stages is to enabling spaces open and free for everyone, especially to students. Because, as Bager Akbay points out in his interview, one of the biggest problems in Turkey right now is to find maker spaces. He also mentions that democratizing in Maker Movement is not just about open source information our free sharing but "is about to give people more options." He defines options as richness. "Option has many varieties, and if the quality of the options is good, then you are rich. If a tool gives you options, if an idea, thinking way is giving you new options, that's right." For instance, if someone was offering you a 3D printer that has options, but if you are just a person who prints their models in the 3D printer, it doesn't give you more options. So the tool itself doesn't give you more options. You also have to think to use it "as a tool". So, this is what Bager Akbay is trying to show the makers in his maker space. The tools are very important but not enough. What important is how to merge different tools together, how to hack the tools, how to transform the tools, how to use yourself to have more options with the tools. So, you also have to change your perspective. In this point, the design process is changing because the variables are increasing by the options.

For instance, as a visual communication designer and art director, my design process follows these stages; defining the problem, collecting the information's, brainstorming, developing the project, getting feedbacks and lastly improving the project/design according to these feedbacks. However, in Maker Movement, we can't talk about absolute design process stages. It is giving us many options, and it is mostly working in a collaborative environment.

The Internet connects individuals across and over national borders and empowers innovative people and groups to discover motivation from each other who share their interests. From cooking to garments, from furniture to saving from electricity bills, there has been an assortment of DIY's creation viral on the YouTube channels, blogs, Facebook, Instagram, and Twitter. It is a revolution where people include themselves in the lives of those who are responding the Internet, sharing and exploring for better solutions to problems in everyday day life creatively. Some of the designers or Makers use Creative Commons to copyright their ideas. Since the Creative Commons licenses are free, it enables other Makers and designers to use and distribute ideas, techniques, and applications further into their makings. The allowance of the use of rights helps creators for their benefits as

they can build on the work by others or engage in the project by referencing them. Open-source offers new ways to reach a wider audience and to make an impact. (Newson, Sugget, and Sudjic, 2016)

As indicated by Christine Henseler, Liberal Arts studies have all the embedded learning results to help the Maker Movement takes its full cycle. This is because Liberal Arts additionally consolidate the self-reflection and verbalization needed to learn out-of-the-box thinking and how products, designs are made, as well as how they are embedded into the framework and can change society with this culture over time. (Henseler, 2015)

Undoubtedly, the primary reason why society is transformed from Maker Movement is that its integration of technology. Technological advancements enable anyone to turn their ideas into real creations as Bager Akbay underlines it in his interview "tools are giving more options". To give an example for technological advancements would be 3D printers, drones, robotic utilities such as Arduino or Raspberry Pi kits. The Maker Fair's CEO Wesley Fenlon claims that the Maker Movement belongs to the kids because creating and making starts when we are children. From Lego's to games like Minecraft, the basis for such creative endeavors starts from childhood. Today small robots, basic code learning applications teach kids to be incorporated into the daily routine of learning along with knowledge of basic design and technology in a playful way. (Fenlon, 2012)

If it comes from all sides of the society, the revolution will eventually inspire and empower a significant number of societies who can create things for themselves, rather than buy from existing industrial markets. Maker Movement allows every individual who is not from an engineering, IT, technical or artistic background, to create and think like them. The creation of the sense of self-efficiency and ability to create things in affordable ways might also prevent the economies from high inflation rates or financial crisis.

2.1 Motivation and Values of Makers

Mark Frauenfelder gives insights into what drives people to make in maker scene and what their motivations are. To him learning new skills, curiosity, self-expressions, desire, being creative, sense of control, relaxing, creating things which

cannot be bought, customization is some of these motivations. (Frauenfelder 2010: 219-220)

Another motivation to DIY communities are based on a survey among 2600 members of online DIY communities, related to sharing and learning: "motivations for contributing to DIY communities highlight information exchange as a core value: receiving feedback on projects, educating others, and showcasing personal ideas and skills are the top factors." (Kuznetsov and Paulos, 2010: 302) "Get inspiration" and "to learn new concepts" (Kuznetsov and Paulos, 2010: 299) and meet like-minded people are top motivations.

Anderson states "a cultural norm to share those designs and collaborate with others in online communities" is another fundamental element beside the technological advancements (Anderson, 2012: 21). The best part of Making is that it has not to happen at home or virtual spaces, but locations such as maker fairs, fab labs bring Makers together under same values and motivations. For instance, Fab Charter says: "Fab labs are available as a community resource, offering open access to individuals as well as scheduled access for programs." (2012)

One of the good examples of applying the shared knowledge is creating an idea/project from one Fab lab to another Fab Lab. It is the next challenge after the learning and creating had been shared. A "foosball table" with score count and replay camera designed from Fab Lab Amsterdam makes it files available online with all instructions to rebuild it. They make it open source. They didn't share the design much and at the end mapping only the manufacturing techniques and technical applications, various designs emerged from different Fab Labs. The shared knowledge has a great value for opening new visions and ideas. (Walter-Herrmann and Buching, 2013)

Figure 2.1, *Illustration and photography of the "foosball table" (source: Waag Society)*

Fab Labs have the potential to improve the daily lives of people who want to create the tools or products they need, close to where they live. Even if they do not have the necessary items for the production, they can use freely the Fab Labs which are increasing in most cities all over the world. (Walter-Herrmann and Buching, 2013: 154).

An example of this kind of effort is the 3D prosthetic arm project created by Osman Koç (İskele'47) for Yağmur (age 6) just by using open source information online.[10] In his interview, Osman Akbay explains that unlikely to his many design/art and interactive projects, the 3D prosthetic arm projects design process has developed differently. In 2012, he saw online a prosthetic leg made with 3D printing technology. A year after, in 2013 he met with "The Future Project". It is an online – global network and forum where 3D printer projects are shared as open source. He followed the works and projects shared in this online community for a few years. It was not until 2016 where he decided to make 3D printed prosthetic arm for free for those who needed. Zeynep Nal, who is one the co-founders of İskele'47, started "Robot El Vakfı" (Robot Han Foundation). A 3D printing community where you need to be registered as a volunteer or need owner after filling a form. Osman Koç became a volunteer and received an e-mail from this foundation. He accepted the 3D printed prosthetic arm project since he had all the tools for the production and space. He downloaded the instructions from "The Future Project" database. However, after meeting Yağmur, they realized that the

arm was too big. It had to resize. That's where the design process started for Osman Koç. He re-designed the whole 3D printed prosthetic arm together with Yağmur. One of the problems were Yağmur was a child and was growing every day. So, the first stage was to make a design so it can be easily re-sized. The second problem was to understand how Yağmur could easily use the prosthetic arm. Osman Akbay says that the arm could design in many different ways; it can be just an arm like most of the prosthetic arms who looks likely a real arm but with few functions. It can be designed where Yağmur might be able to use just the joint points of the arm. But he did more and designed the arm so that Yağmur could use the fingers to hold objects. Osman Akbay points in his interview that in Maker Movement's design processes the most important thing is testing and lapse. Prototyping is another stage. You must know the materials you have very well but also be open to use new materials and test them with different tools. He explains this stage as "Unconscious discovery" and underlines that inspiration is equal to the materials you own. He says that if he had not the materials for the prosthetic arm project, he would have had not considered starting this project. He also says that in this 3D printed prosthetic arm project, unlikely to his other works and projects, he realized that it was a project that shaped during the process. So, he also designed his design process while making it. There was no planning, no timing. And furthermore, he also redesigned the project so that if any part is broken or needed to be fixed, anyone can fix it easily. So, Yağmur is not affiliated to Osman if she needs anything about her prosthetic arm. To be more precise Osman's design process is democratized and it allows anyone to continue, change and develop his project.

With Waag Society's Foosball Table and Osman Koç's 3D prosthetic arm examples, we see that open source online networks that are democratizing data, design process and digitalization with connectivity are lowering the cost of production. Also, this allows more and more people aka. Makers to form their thoughts/ideas into prototypes and test them with consumers. Hackerspaces and Maker Faire like events quicken the process of production, sharing and testing prototypes by bringing common share and interests under one roof.

As it gets easier with time accessing to the tools of production, sharing information and experience and prices getting lower in technologies such as 3D printers, the obstacles Makers face in making are vanishing. By that, Makers reach

to a wider range of producers, marketplaces, and providers by democratizing the design process.

2.2 Maker Types

Tinkerers, designers, hobbyist, inventors, craftspeople, do-it-yourselfers they can all be considered as Makers, and the number of participants who call themselves as a maker is growing around the world. But, according to Dale Dougherty,[11] however, there is not a single maker profile, and he divides Makers into three categories: Zero to Maker, Maker to Maker and Maker to Market.

2.2.1 Zero to Maker

The first category Dale Dougherty makes is "Zero to Maker". (Dougherty, 2014) Zero is the first stage of a Maker. The person decides to be a Maker and has no previous experience or attempt. To become a Maker from "Zero", there are two main steps to follow: the first step is collecting and understanding the information about to "create" and "how to design it." Later, learning how to access to the tools that are needed to create. Outlines and tool guidelines for tools such as 3D printers, laser cutters or other tools can be found easily and open source from websites such as Thing verse and sustained directly to the production tool. As an individual gain skill and expertise in modelling and design software programming areas, he/she can easily access in modest desktop programs like Autodesk 123D to create what he/she wants.

The barrier to access to the tools and technology is lower now not only to the low costs and developments in technology but also by the increasing numbers of more shared spaces like hacker spaces, and Fab Labs are opening. These spaces enable memberships to Makers which they allow every tool and information to use. As an after-effect, these and other Makers cooperate with each other to bring down the obstructions to Making, empowering more individuals to go from zero to maker.

2.2.2 Maker to Maker

The second category Dougherty mentions is "Maker to Maker". (Dougherty, 2014). After, collecting information for design and access to the tools of production the second stage is to create the communication between one Maker to another Maker, which is the most critical and important stage. Because what it makes a Maker is not only to create something and find the information or tools that are needed but also connecting with others to improve its product and others. While s/he gets inspired S/he must also inspire others. By digital communication tools like social media, forums, and hacker websites open sharing this sharing and communicating got easier and accessible globally. Also, it has started to shape the quality and services of these platforms. Step by step guidelines, how to videos are becoming more and more popular every day on YouTube, or DIY projects, 5-minute everyday life hacks on Facebook are getting more attention than ever. These channels for learning and creating also connect Makers to each other. On these platforms, Makers freely share their ideas and projects, allow others to alter and enhance them. Make comments or analyze their projects. These platforms include forums or comments spaces where members answer each other's technical questions, review projects and create teams around particular areas of interest. This open sharing concept helps the Maker ecosystem to develop and creates a demand of financing new marketplaces for production. As a result, the step of Maker to Maker does not only create a new platform for sharing or does not only support the communication between Makers but also and undoubtedly, it builds an area for those who want to help or work with Makers without being a Maker.

2.2.3 Maker to Market

The last category is "Maker to Market". (Dougherty, 2014). As mentioned in Maker to Maker part, there is also an area which people who want to work or help Makers without being a maker. As more Makers connect with different parts of the maker community, some will look for a benefit and consider commercializing their products and design. The barriers to assembling and commercialization have been reduced. Converting information into digital format and making this information exchange free has brought down start-ups and

exchange costs. Additionally, digital tools like 3D printing and laser cuts reduced the expenses and lowered the costs. As a result, functionality and technologies like 3D printers can overcome inherent during the design process and reduce the costs.

There is now the advantage for Makers to scale their products. There are now increasing the number of incubators, financiers, and mentors ready to help Makers to refine their products and finding solutions to bring them to market. In the most recent five years, crowd funding platforms like Kickstarter and Indiegogo have financed a huge number of dollars of Makers related projects, while associations such as Shapeways and Ponoko are enabling Makers to transform the complex design into real products. (Hagel, et al., 2014). The more these Makers 'ideas and creations are supported, the more the impact will be seen across society and business areas. The ability to solve problems, real-world problems draws many productions in the end to a global economy.

Another classification to Makers comes from Maker's Manual by PSFK Labs and Intel. Their rating is based on skills, the degree of their involvement and knowledge. Per this classification, there are five groups: the DIYer's, the Self-Learner, the Educator, the Pro-Maker and the Entrepreneur. (Fawkes, 2015)

The DIYer's are the ones who are usually associated with hobbies, craft, tinkering or constructing experience. Most of the DIYer's are curious about trends. The Self-Learner is often related to own projects-objects. He/she uses mostly online platforms and forums and uses regular tools and resources. The Educator's focus is not only developing himself but also teaching and consulting other's projects. Pro-Maker embrace's and uses new technologies to scale its projects. They have advanced knowledge of machine operations, computers, coding. Lastly, the Entrepreneurs are a subcategory in the maker community. They are responsible for commercializing products and ideas. Giving feedbacks, being aware of trends, advanced in resource funding's and marketplace. This also helps to build a sustainable business.

2.3 Maker Community's Impact on Governments

Public entities extending from local to nationwide are turning out to be progressively involved in Maker Movement by either organizing or sponsoring maker related events/ partners/ labs/ schools to provide new services to citizens. The biggest and maybe the most notable example is the approach of the United States to Maker Movement. By this example, it comes more clearly to understand how Maker Movement affects the society and democratize the access to the tools of production and information which affects the design process at the same time.

The United States is the most active country regarding Maker Movement. That is because of the popularity over attendants to Maker Fair's, governmental decisions and educational system reforms. For example, the US government organized in 2014 the first White House Maker Faire (Kalil and Miller, 2014) to call "every company, every college, every community, every citizen joins us as we lift Makers and builders and doers across the country" (Obama, 2014). The White House has encouraged volunteering, mentoring, workshops and classes. Established maker spaces in schools and campuses. Aside from the Maker Faire they also partnered with TechShop to offer maker programs to war veterans. (Kalil and Miller, 2014) Most of the libraries in the United States have books about 3D printing, machinery to foster the creation of maker communities. (Thompson, 2014)[12]

The Maker Movement is also reaching developing countries such as Uganda, Georgia, and Peru, where projects of opening maker spaces are being developed with the hopes of motivating youths to innovate, eradicate unemployment and cover local needs (The World Bank, 2014). Also, in Turkey, we see that Maker Movement has also been initiated in Turkey too with ateliers, maker spaces, Maker Fair's and hacker spaces.[13]

To have a quick look at Maker Movement in Turkey, we can expand on Turkey's first Maker Community online platform. In *The Media Line*[14] Nick Ashdown's interview with Ongun Tan, founder of "Makers Türkiye" who highlights the need for more workspaces for Makers so that they can come together and work together. Co-working spaces, maker's lab can be rented by Makers temporarily. Today, these places are often rented by freelance workers or small companies to work or take classes. In other words, Tan implies more spaces for

collaborative work, co-creation environments like Kolektif House or Urban Station are needed in Turkey.

As one of the examples of these kinds of collaborative work spaces, "Atölye Istanbul" opened in 2013, in Istanbul. Atölye is a Turkish word, which stands for workshop or studio, where creative minds and freelancers complement each other in art, architecture and design fields.
In another interview by Ashdown on *The Media Line, 2015,* Ezgi Altan says that the idea behind Atölye İstanbul is to "create a community where people from different disciplines can come together under one roof and cooperate with each other to work on new projects." According to Altan, "the primary focus of the project is to foster a new culture of working together and generate a cultural community based on collaboration."

Nick Ashdown continues his interview with Hakan Pakten and Zeynep Karagöz, which runs design firm Beş Dakika which is also, a part of the Maker Movement. Karagöz explains how technology is changing design and production process inside the Maker Movement. As mentioned before in chapter 3, Customization, Karagöz explains in the Ashdowns interview how the Internet has supported democratizing information, as quickly accessible open source data. "3D printers, which have recently gone down in price acutely to as low as a few hundred dollars, take it a step further. With 3D printing technology, the physical world is also changing, because everyone can print/make what they want." With low prices and open source design and data, anyone can print anything from jewelry pieces to IKEA style models already interlocked to industrial prototypes.

The Maker Movement is growing each day and spreading. Some schools and universities have already embraced the Maker idea and activities in their curriculums or student activity clubs. One example from these schools is the Darüşşafaka Robotics Team.[15]

Even though these activities are inspiring in Turkey, the government, unfortunately, does not support the activities as it is in the United States yet. And the innovation culture is not as high functioning, as it should be considering country's educational programs. There is a lack in defining the need for creative problem-solving skills in the society. (The Report Turkey 2013: 34)

3. Customization

The term design is a product of the Industrial Revolution in the eighteenth century. (Newson, Sugget, and Sudjic, 2016) Mass production strict the connection between the craftsman and consumer. Because of that mass production demanded expensive investments in production tools, designs had to be created in a more cheapie way. But with digital manufacturing, for instance, 3D printers, it offered the designer/maker a wider range of production. For the first time, products were tailored for the individuals with new materials or ways.

Innovation and technology have turned out to be more moderate and simpler to obtain. The Maker Movement comprises of people who are outlining and making their items and distributing and sharing thoughts as mentioned in Chapter 2. The Internet has enabled us to exchange ideas, which allows Makers to take ideas from a source and create off that thought. The Maker Movement has been changing how organizations work and the regular day to day existences of Makers. It allows more independent organizations or people to make, offer, sell, and share their customized design/products.

The Maker Movement is keeping on developing as more individuals become aware of the capacities of 3D printing, Laser cutting, and different apparatuses. There is an increase in the function and content of the Internet sites such as Pinterest and Etsy that enable and foster people making and offering their items or creating DIY Projects. This is changing the lives of people because without higher educations they still have an excellent shot of accomplishment. People no longer need to work with a large organization; they can work for themselves or begin their own business. Many individuals will purchase less fabricated items since they esteem their hand-made work more. Many are planning for themselves or for companions to make a custom item that is relevant and valuable to them. We design for who we want to design for. The Maker Movement takes into consideration customization, and for Makers to plan and create extends outside of an extensive participation.

3.1 How to Democratize Tools and Technologies in Production?

Dougherty wrote that the Maker Movement is developed by the presentation of new technologies like 3D printing and microcontrollers. By this, new opportunities made faster and easier for prototyping and manufacture tools became easier to source from the web. Kalil mentions that "the discourse surrounding the Maker Movement, particularly in the political spectrum, focuses heavily on STEM (science, technology, engineering, mathematics) education, manufacturing, and jobs" (Kalil, 2012).

It is important to understand how and why these technological advancements impelled the Maker Movement? The word democratized is used when something is accessible to everyone. In the context of Maker Movement, we can refer it regarding technology and tools because of the decreasing costs and designs that enable the user to use it at home. Britton explains the value of Maker Movement in the democratization of power as he claims, "through an examination of the exchange encompassing the Maker Movement in political, economic, one noteworthy topic has surfaced as a response to this question: the democratization of the tools of production" (Britton 2014).

With the decreasing sizes of tools, the production tools are easier to use at home. Like the computers, they used to be massive and expensive but in the late 80's their small sizes, and low-cost ones enabled everyone to have a computer. The same idea applies to the 3D printers and microcontrollers [16] as the "new technologies are often presented as liberating, democratic or even utopian." (Newson, A., et al., 2016). Unfortunately, new technologies are not enough to democratize production. Without doubt, it makes the process and production easier but first, to democratize the production and tools, governments must contribute with companies and creators to engage more people in this movement. Moreover, Maker spaces must be organized. Companies should sponsor start-up projects. Tools of production can be only democratized if only it can be used by the masses.

3.2 Customization vs. Brands and Companies

In the last two decades, technology has allowed companies to work more consumer-centered. Not only by products they serve but also advertising them and allowing to create customized products for the consumer itself. Now, brands and companies step forward to mass customization rather than mass production. The opportunity in this decision is significant, according to the survey of Bain more than thousand online shoppers got more engaged with the brands when they could customize the brand products.[17] The main reason behind this increasing engagement is that the loyalty to brands does increase. For instance, Nike partakes it with customization in colours and patterns on their shoes, so to what extent, until the assembling procedure considers custom images/patterns or examples on our shoes?

Besides, this customization can be not only explained via the product customization served by brands and companies. With the rise of the Internet platforms such as Etsy and Creative Market, individuals can sell their custom products and even produce products by order. Etsy has been at the heart of the significant handcrafted upset, enabling producers from around the globe to associate with a worldwide crowd to the tune of $1 billion in yearly exchanges. (Eha, 2016) Creative Market, on the other hand, is popular by its graphic design elements such as Photoshop mock-ups, cards, notices, etc. which are mostly used by graphic designers and art directors who work in advertising agencies. And the products are updated by needs. For instance, in 2014 with the rise of hipster theme, most of the graphic elements included hipster style graphics, t-shirts, vectors and even logo designs.

As customization gets more important in consumer space, the tools that engage consumers to be their designers and deliver good results are as fundamental to item quality as the assembling procedure. With each creative venture, there are tools that help the maker work better, quicker. That change has started to occur in pockets of existing organizations as of now.

In an article in howdesign.com, three projects are given as customized brand product examples which summarize the engagement between consumer and producer perfectly. [18] Coca-Cola's the Freestyle fountain, which gives pop purchasers the capacity to make their design from more than 100 distinct flavours. Nike ID makes possible now to customize shoes by changing colours and patterns

through on the online applications or in retail studios. (Palmer, 2016). Mars has a whole specialty unit devoted to altered confections and items called Mars Direct. (Seybold, 2015). Hershey joined forces with 3D Systems to make the CoCoJet 3D Printer (Shandrow, 2015)., equipped for printing especially custom tastes in chocolates.

Figure 3.1, *Examples of customization tools designed by brands. From left to right; Basketball shoe design with Nike ID, Mars Direct – Create Your Own M&M's microsite, Hershey 3D chocolate printer CoCoJet 3D. (2016)*

Such customization will be the standard as individualism gets more important and with the technologies like 3D printing, we will have the capacity to create every customized item. The only thing that is needed is to, think, organize, find the resources with creativity, and you are done!

Items that used to be produced by centralized manufacturing product will be and is already created locally. As the 3D printing gets faster and its price drops, more products will be designed for their purpose of utilization. "Today, innovation is concealed in the R&D divisions of organizations. Funding is given by corporate finances. Production happens the world away in a production line as it is in like China." (Hagel, Kulasooriya, and Chen, 2015).

Creative subcultures will come around with common interests together to share thoughts and create together. Some may be a part of groups some will work with companies like Saunders, and some will work individually on online platforms such as Etsy. Others may exploit expanding the network to cooperate for all intents and purposes. In any case, the outcome will be resurgence in innovativeness, craftsmanship, and group.

A few products will dependably be commodities such as main materials like plastic, wood, and concrete that 3D printers use. But still, merchandise that requires huge scale, speed, and productivity will be mass-delivered and partnered with. For instance, if you want to make 3D printed prosthetic arms on a huge scale, then you may need a sponsor or a partnership for your requirements, and that takes you from an individual Maker to a producer in the economic system.

Recently, even if we have the capacity to customize almost any product it has still technical difficulties and the tools of productions are expensive. But, when tools like 3D printing, item many-sided quality will turn out to be free—and along these lines, mass customization could surpass large scale manufacturing.

Presently, in logistics of goods, about 80 percent of shipments are done items, and 20 percent are crude products. Instead of making items, partnerships will concoct fundamental systems giving individuals the ability to assemble it as they wish. As production is democratized, by this I mean when everyone who will be able to produce what s/he wants and merchandise gets personalized, the work system for organizations will drastically change. It won't be may be a huge difference or change to high scales, but the communication and interaction will be affected for sure. Therefore, organizations which want to stay significant in this maker future should re-evaluate their plans of action.

However, regarding merchandise and commercials, there is one point that must be debated. No matter how much companies and brands try to change their strategies in communications with the consumers through advertisements, social media and change their products to more customized designs, even though it serves by providing tools and products for makers, Maker Movement creates small economies.

A social movement does not create a commercial value. But in commercial and merchandise, you make the user dependent on yourself. Going back to Osman Koç's 3D printed prosthetic arm when we look to the market we see the most of the medical prosthetic arms are more realistic to an arm rather than being functional. If you want a prosthetic arm that is looking realistic and at the same time functional, it is costly, and if you face any problems that have to be fixed, you have to turn it to where you have bought it. By democratizing the design process, Osman Koç removed that stage. And also designed an arm fully customized. In his interview, Osman Koç also points out that right now Maker's can face problems like licensing

and patents if they decide to sell their products. Those licensed and patents are protecting the market for their goods. But, as a maker, it is possible to hack this too. "Remixing" he calls it. With small changes in the designed object or product, it is possible to be not affected.

As an example, Bager Akbay gives the example of Lego's. Lego company has one of the largest licensing codes. But when we look back to main objects of makers, especially who works on coding and Arduinos we see similar products like Lego's they created with a 3D printer. Lego as a product design gives many options to the maker for building and creating material. And it is one of the most printed objects. So, what makers do is they combine little robotics and sensors with 3D printed Lego's to create interactive projects, new tools for their projects, etc. Because even Lego is perfect for makers, it has no electronics and parts for it. And since it is not in the market, the selling is from maker to maker.

4. The Signification of Maker Movement for Future Economy

With the Maker Movement, we are raising the diversity of the products. Instead of having only big factories now we have lots of small versions of them. There are lots of brands are coming. But then we have to have organizations with brands. That's where the digital tools are coming handy like 3D models and Arduinos. This is like a guerilla company structure. Everybody becomes a company. We can call it positive economy. For instance, you create an open hardware product in ARGE and then you allow anyone to copy it. It's forcing others to create another product. People can make versions of it. Customize for personal use and create this will create a small market. If it is a useful tool, it creates a community.

For open hardware product, we can give Arduino as an example. Arduino was an art student project. When it first came, Intel ignored Arduino for a long time even if it was used by a lot of people. When Arduino was first designed, it had a glitch. One part of the pin space was a half pin space which was an error. And, it was released to a field with this error, because of shipping problems and financial problems they could not solve the error. But that error created an open community. Other users started to create shields for Arduino. So, we can call this a big team of guerilla marketers working along an idea. Today, Intel has products that are compatible products with Arduino. To sum up, open structures gives more opportunities to the economy.

In 2011, Social Innovation Europe (SIE) was set up[19]. Financed by DG Growth (The European Commission's General Directorate of Internal Market, Industry, Entrepreneurship and SMEs)[20], this stage has turned into a group of more than 3,000 individuals crosswise over Europe that takes a shot at comprehension the setting of social development in various nations. It is a meeting spot, a center, where inventive scholars meet up to make and build up the act of social development field in Europe. Because of the occasions that SIE composers, social trailblazers, scholastics, and professionals get together to examine an ideal approach to scaling social advancement and how the EU can bolster its improvement.

In the report of May 2015,"Making Good our Future: Exploring the New Boundaries of Open and Social Innovation in Manufacturing", three measurements

have been recognized for development in European assembling: 1) A horizontal dimension, Democratization of Making: Manufacturing turns into a participatory procedure in which the space of large enterprises are supplanted by the participation of individuals. Using CNC machines (computer numerically controlled) or similar production tools, are no more extended simple buyers, instead, Makers also, de-monopolizing the 20th-century industrial complex. 2) A vertical dimension, Supply chain for good: Companies are more affected by their impact and brand image on society and are advancing transparency all through the supply chain. 3) A transversal dimension, Corporate Citizenship: Social and environmental concerns are currently arranged at the focal point of endeavors' business strategies and decision-making processes. [21]

New digital production tools and methods that are coupled with online market spaces make such factories redundant. Technologies such as CNC (computer numerically controlled) and 3D printing open source networks are removing the barriers that the maker and manufacturer have, and enabling more and more people to create and produce individually. As Karl Marx refers to those who control the mean of production controls the political power, but with Maker culture, the traditional manufacturing changes the output controls. So, small scale Makers and businesses came in a power which challenges the big companies which are in the mass production line. (Marx, 1984)

The democratizing idea could be very easy capitalized. There is a very thin line where when designers/makers start to collaborate with companies they become also commercialized even the tools of production or free information and data sharing is used. If something is commercialized, capital than it's loosing it's what I call democratizing in Maker Movement. There are protocols and regulations. The regulations are changing. So, we have to understand the process. In the Maker Movement, what is democratized is the process. After the product is designed, it can be easily commercialized.

The approach *European Union Policy Paper* perceives the transformation that the Maker Movement has made regarding financial models and techniques. Peter Troxel, Research Professor at Rotterdam University of Applied Sciences and board individual from the FabLab Benelux Foundation, stated in this respect that the built-up framework doubtlessly has made over the span of a quarter century.[22] According to Troxel, what we call the second Industrial Revolution has particularly

been about globalization, about centralization of decision power with colossal corporates, huge organizations, which is a very much a top-down approach. What we see in Fab Labs is an inverse development which is base up, like globalization versus customization. In any case, corporates are not clumsy, and they quickly observe that this base up example has a lot of constraints. In the Fab Lab world, corporates and businesses can base up their advancement and should be more mindful of any attempt to focus and move that into the hand of top-down ventures. They must follow and understand the changes and needs in society.

Because of the work of Fab Labs, Maker spaces, and Maker Fairs has authoritatively entered the European financial vision. Through the EU policy paper, the EU recognizes the potential and standards of the Maker Movement and pronounces its dedication to supporting it keeping in mind the end goal to make and build up another fiscal framework to the economics that can emphatically influence the built-up undertakings as far as social advancement.

4.1 Creative Economy

The main impact of Maker Movement to economics is that it creates a collaborative economy where common technologies like 3D printer enable Makers to get the goods they need from each other instead of buying from established companies.

Many technology-based companies have evaluated and have adapted. They made transitions from producing mechanical business machines to create services, creating new communication systems or developing devices for individual use like IBM which developed the first laptop and now is one of the first and biggest companies that make investments to Maker Fair's and supports ideas and help prototype design transform into real products. Another example is Google, which when it was just a web browser service and now they are shaping the utilization of new technologies and the direction of service design.

Google's latest invention Google Glass has brought a new wave of wearable technology that allowed users to get to the data in another way of the communication system. Intel on the other, where the main company area was producing computers now they are like IBM one of the main companies who engage Makers in creating innovations and big companies sponsor Makers in their

Kickstarter projects. These stimulate Makers by enabling them to achieve their projects and ideas individually and set up their businesses.

Currently, in Turkey (2017), one of the biggest providers of production tools like the 3D printer and supporter of Maker Movement is 3Dörtgen. It is world's first concept shop and cafe founded in 2013 İstanbul by Furkan Bakır. Rather than a commercialized formation, they tried to introduce with 3D printer technology the Maker Movement and give inspirations. Today, they are co-working with many cafés, libraries, maker spaces and university club's to spread "maker-friendly" concept all over Turkey. They are the biggest and the first 3D printer provider, and they also give free trials of the product; they contain a library about books themes maker, they make free workshops about 3D printer using and design. Doğukan Güngör, one of the co-creators of 3Dörtgen emphasizes in his interview that with the workshops and community we have, we see today we can design and create any object we need. It is a significant development to get something we want or need easier and cheaper. But, we also realize that accessing to the 3D models from open source spaces ad than printing them in 3D printers are not enough. Just like learning a second language like English for Turkey was very important in our lives, today learning design and design thinking methods are as important as it is. Here, in 3Dörtgen Doğukan and his team are providing every practical education and tools, however, to create/make something like Osman Koç mentions in his interview, we have to hack and remix the tools. That is how this movement can help for a better future and allow anyone to become a maker.

5. Conclusions

This thesis analyzes how Maker Movement emerged, how Makers are identified, how maker community exchanges their knowledge and experience open source and engage each other for better solutions concerning production. The study brings out the impact of Maker Movement on government action plans like White House supporting Maker events and merging the DIY (Do It Yourself) culture in education while demonstrating how this movement affects today's economy focusing on the design process.

The issues in this study are organized considering the timeline of Maker Movement. With the launch of the Make Magazine in 2005, Dale Dougherty coins the terms "Makers" and "Maker Movement". In the same year, makezine.com was launched which was the first online platform that supported do projects. In 2006, first Maker Faire in Bay Area San Francisco was launched. In 2009, with attendees in New York Young Makers were initiated. With the spread of the Maker Movement and seeing its effects which are explained in detail in this paper, we see that "Educate to Innovate" program started by President Obama which is the first example a government accepts this movement and acts. In 2010, we saw that the first "World Maker Faire" was launched in New York with attendants worldwide. After 2010, we see in many countries Maker Fair's, and workshops are organized.

In the interview with Bager Akbay, we discussed and analyzed the maker spaces, the importance of maker culture in education. Osman Koç's 3D printed prosthetic arm project showed us how the design process could be democratized in Maker Movement and with Doğukan Güngör we talked about it company 3Dörtgen, one of the Turkey's biggest 3D printer provider and Maker culture supporter.

With the Community Exchange topic, we take a gander at how digital platforms such as YouTube, creative commons, Etsy, forums, blogs and physical spaces like hackerspaces and Fab Labs are helping the Maker Movement. These spaces help to organize and uniting individuals to share experience, resource, and information and at the same time creating new commercial marketplaces, businesses for their products.

The Maker Movement has been accumulating an increasing momentum while expanding the field into an ecosystem community where the Makers can innovate, design and produce new products and administration. Throughout the years, the Make division has associated with Maker Movement and groups who are within the movement are growing every year.

Most of the Makers are called as DIY'ers, hobbyists, or inventors. But what they are is additionally making new products, creating new and creative solutions to everyday life problems and delivering esteem in the Maker community and with the right connections some of the Makers do get in the business and marketplace or begin start-up projects via Kickstarter-like platforms.

In chapter 2, I discussed and analyzed the design process of a maker by interviewing Osman Koç, one of the co-founders of Iskele'47. He is an electronic-mechatronic engineer and artist. I focused on his 3D prosthetic arm project to understand how Maker Movement effects the democratization of design process.

In his interview, Koç menstions that accessing to the tools of production is easier today but the design process shapes by exploring the materials and tools he has in his hand. When he first started to 3D prosthetic arm project, he has found all the information for production online and for free. He explains that his first prototype was putting every material in the right order and putting them together. But after that, the design process started. He had to re-design the arm for its user. First, it had to be re-sizable. Secondly, it has to be re-designed to make it more functional for the user. And lastly, it had to be designed so that it would be changeable and fixable independently from the designer, Osman Koç.

From Koç's design process what we have seen the Maker Movement's effect on democratization on the design process is making a product that it can be modified and fixed independently from its producer.

Also, a maker does not have to invent or design something completely new. What the Maker does is remixing materials and creating something entirely new from it.

However, we have to understand that there is a very thin line in democratization in Maker Movement. If the product or design is commercialized than it can easily be capitalized. Therefore, even many brands started to work with Makers and attempt to create customized products at that point it can't be considered inside Maker Movement. That's why the in this part we can only talk about the design process is being democratized.

Maker Movement has re-defined product design with attention on customization. Although customization has been considered as the perfect model for successfully promoting and publicizing for quite a while (like NIKE ID), this line of speculation has now reached out into assembling. Today's shoppers are searching for things that are made by hand, feel extraordinary, and are remarkably their own.

On the opposite side of the path, more individuals are beginning to consider producing not only the elite domain of colossal Makers. Presently, smaller businesses and single entrepreneurs are getting to transform into maker companies such as Ineke Hans and are primarily re-examining the model of the maker as a high-volume operation that is intended to deliver individual units that are the result of a single product design.

This brings us to another type of effect on Maker Movement's effect on democratization the design process. By creating work spaces, maker café's for free, and this also leads to the democratization of design process.

The Maker Movement will expand its constituency with support from many stakeholders from government, companies, organizations, and industry. Here I made an interview with Doğukan Güngör, co-creator of 3Dörtgen. In his interview that with the workshops and community we have, we see today we can design and create any object we need But, we also realize that accessing to the 3D models from open source spaces ad than printing them in 3D printers are not enough learning design and design thinking methods are as important as it is. Here, in 3Dörtgen Doğukan and his team are providing every practical education and tools, however, to create/make something like Osman Koç mentions in his interview, we have to

hack and remix the tools. That is how this movement can help for a better future and allow anyone to become a maker.

With governmental support as it is in the White House of Obama's administration, Nation of Makers activity and the extension of local Maker spaces and Maker communities, the development has fashioned a place in the 21st-century zeitgeist. Although growth of the Maker Movement is essential, close attention must be paid to maintainability endeavours too. As Will Holman points out in his article on the eventual fate of Maker spaces, "the next challenge is plain: to build a deeper Maker economy that can sustain Maker spaces, and Makers themselves, on a broader scale" (2015, p. 15).

The Maker Movement ought to embrace a more all holistic approach; must focus more on education and its cultural role by going up against more institutional responsibilities and connecting audiences worldwide. For the individuals who approach Making as a profession, best practices, network opportunities, should be explored.

Therefore, I interviewed with Bager Akbay, co-founder of Iskele'47 and educator in Maker Movement and discussed how Maker Movement effects on education in Turkey. At the end of the interview, we understand that the Maker culture is still missing, but the demand for Maker culture is increasing very fast. We see that many schools and universities in Turkey are providing FabLab's and events, but the problem is that by putting the best tools of production like 3D printer's they restrict freely use these tools by students. Bager Akbay compare's it like museums.

We could then discuss how the Maker culture can be spread more in education. He responds it with an example. A maker event was done in a shopping mall in Istanbul. More than 2000 children attended the event and learned the basics of coding, hacking objects, learning how to use 3Dprinters, etc. By this, when the children go back their home and schools they create a demand for Maker culture. So, we see now that more and more schools in Turkey started to teach coding lessons for example.

Also, today in more than 50 cities in Turkey we see Maker events and fairs are organized for kids. The important thing here is to create demand and then with the support of organizations, brands, and government to make these events for free and accessible to everyone. An example for this is Turkcell's start-up project Maker Çocuk.

As indicated by research transferred by Holman (2015), the Maker economy is anticipated to hit $8.41 billion by the year 2020. With the potential of currently active, imaginative, and comprehensive Maker programs, a significant portion of which was showcased by summit members, and the apparent enthusiasm and responsibility of the Maker community to help the development thrive, Maker Movement can get to the next level. Governments and educators should consider merging Maker culture in our systems based on the effects of Maker Movement both on society and economy.

In this study, we see that advantages of democratizing the design process in Maker Movement. However, Maker Movement is continuing to grow every day, and we will continue to see it impacts to the society and economy over time. And how it will change can be understood by focusing on questions like who is creating/designing the materials? Who is controlling the fields? Democracy comes with its problems. Like, what happens if we enable everything to be freely shared and accessible? Right now, there are neither restrictions nor laws for digital sharing and prototyping and creating products. What happens when people start to build with these maker tools weapons? Who then takes the control? Therefore, as designers we have to get more in this Maker Movement for democratizing the design process, to teach the ethical codes and to transfer our knowledge of problem-solving to the other makers.

Maker Movement and the Maker Community might shine a light on our formal values, ethics, and communication, as this study is an on-going project since the Maker Movement is still in the making with continuous development and growth each day.

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- Pegasus - Turkey's First Instagram Stories Campaign

- Doğus Group - Sanata Bi Yer

MIXX Awards Turkey, *2017*

- Pegasus - Turkey's First Instagram Stories Campaign

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FELİS Awards Turkey, *2016*

- Pegasus - Turkey's First Instagram Stories Campaign

EFFIE Awards, *2016*

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34.GMK (Alliance of Turkish Graphic Designers) Best Type Design Award, *2015*

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- Type Object by Barbara Brownie, *2012*

Notes

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⁹ Kadir Has University is associated with İskele47, one of Turkey's first maker space and bring kids to learn and discover coding, technology, robotics, etc. via creativity and play. Or it has its own Fab Lab.For more information see note 1.

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