AN INVESTIGATION OF MAKERSPACES FOR THEIR CONTRIBUTION TO SOCIAL INNOVATION

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has been approved by:

Name of the jury member

(Thesis Advisor)

……

Name of the jury member

…….

Name of the jury member

(External Member)

……

DATE

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ABSTRACT

Makerspaces are workshop areas or programs where communities or/ individuals collaborate together, share knowledge in an open source way, and produce products fast with an easy access to fabrication tools. According to my argumentation, makerspaces create a fertile atmosphere for social innovation by lowering the barriers in access to knowledge and tools and by improving the dialogue among various actors from different sectors. In this Masters Thesis study, I aim to discover in which ways makerspaces contribute to social innovation process. 4 makerspaces, established in Turkey, which are the pioneers of the Maker Movement in the region were chosen for case studies. The organizational models and diffusion models of these makerspaces are examined and the cross-case analysis of these makerspaces are discussed with the social innovation literature. As the studies on social innovation are still in early stages, this research aims to understand how social innovation is being practiced in the real world through makerspaces while contributing to the social innovation studies.

ÖZET

Maker atölyeler, komünite ve/ya bireylerin işbirliği yaptığı, açık kaynak ile bilgi paylaştığı ve üretim araçlarına kolay erişim sağlayarak hızlı bir şekilde ürün üretebildikleri atölye alanları veya programlardır. Hipotezime göre, maker atölyeler bilgiye ve araçlara ulaşmaktaki bariyerleri aşağıya çekerek ve farklı sektörlerdeki çeşitli aktörler arasındaki dialogu arttırarak sosyal inovasyon için elverişli alanlar oluşturmaktadır. Bu Yüksek Lisans çalışmasında, maker atölyelerin hangi yollarla sosyal inovasyona katkıs sağladığını araştırmayı amaçlıyorum. Bu tez kapsamında, Türkiye'de, bölgedeki Maker Harekatı öncülerinin kurdukları 4 maker atölye vaka çalışması olarak seçildi. Bu çalışmada, maker atölyelerin organizasyonel modelleri ve dağılım modelleri inceleniyor ve maker atölyelerin karşılaştırmalı analizi sosyal inovasyon literatürü ile araştırılıyor. Sosyal inovasyon üzerine yapılan çalışmalar erken döneminde olduğu için bu araştırma sosyal inovasyonun pratikte maker atölyeler aracılığı ile nasıl gerçekleştiğini anlamayı ve sosyal inovasyon çalışmalarına katkı sağlamayı amaçlıyor.

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CHAPTER 1. INTRODUCTION

This research proposes to analyze the makerspaces as a field of research in order to understand what social innovation means and how its mechanisms work. Additionally, a study about social innovation seems crucial, specifically, for the developing countries like Turkey, where the case studies are selected. As social innovation becomes a generator for the new type of economies, many countries develop strategies to integrate into social innovation dynamics. Accordingly, makerspaces can provide a creative means of community and collaboration in terms of increasing the dialogue to improve the conditions for social innovation. For that matter, makerspaces bear the potentials for social innovation even though the studies carried out on the subject is in early development.

In the section 1.1., the phenomenon of social innovation will be briefly introduced and social movements will be discussed as one of the most effective catalyzers for social innovations to emerge. The maker movement provides a potential source for social innovations as it has become widespread around the world by lowering the barriers for accessing knowledge with open-source and enabling more and more people to engage in production activities by blurring the lines with production and consumption. Section 1.2. examines how the maker movement has developed while in section 1.3. makerspaces which are an important component of the maker movement will be discussed in detail. In the section 1.4., the relationship between makerspaces and social innovation will be touched on in the light of literature while what Turkey provides for the discussion will be introduced. In the final section (1.5.), the scope of this research will be defined along with the research question.

1.1. Social Innovation

Social innovation is gaining momentum in recent years as it starts to be commonly used by a wide range of individuals as well as institutions. As it will be discussed profoundly in Chapter 2, since the last decade, social innovation has become a prominent topic for scholars, corporations and public institutions due to its possible positive effects on social welfare and sustainable development (Sanzo-Pèrez, Álvarez-González & Rey-García, 2015). Moreover, the development and adaptation of information and communication technologies (ICTs) have acted as catalysts for generating social innovations by connecting communities and networks and lowering the barriers for communication and scaling (Millard & Carpenter, 2014). However, despite of its growing pace and the interest, the definition of social innovation as well as its references as a term still remains ambiguous and controversial. This ambiguity emerges from the lack of detailed and diversified researches based on social innovation, which leads a shortage for accumulation of knowledge (Pol & Ville, 2009). In this matter, understanding the trend of social innovation is highly valuable. Thus, the whole picture of the process becomes more comprehensible and explicit through an analysis based on specific fields of implications.

Several factors and events generate social innovation and these range from individuals to organizations. The social movements mobilizing millions of people along with organizations have been influencing and accelerating social innovations all around the world. Social movements are shaped around a problem or a need, leading to growing discontent of the masses who feel the urge to take an action. Even though it is not possible to trace back the core cause of those social movements, social innovations

empowered by social movements are formed around similar social values. Therefore, social movements can be both the outcome and the cause of social innovations. While one of the outcomes of the social innovations can take the form of new social movements (Mumford, 2002; Phills et al, 2008), the social movements can result in social policy change along with social norms and paradigm shift, which may reveal the connection between the social change and social innovation (TEPSIE[1], 2014). As an example, the spread of the feminist movement in the 1960s created an urge for the formation of feminist collectives and networks. These formations led to the increase in actions in women's right, some of which are even legislated (Mulgan et al., 2007), resulting in the systematic change, suggested by the social innovations.

In this context, the maker movement and subsequently the makerspaces, which is the focus of this research, is a process emerged from a need to become “more than just consumers” (Dougherty, 2012, p. 12). The maker movement aims to promote open source knowledge sharing and collaboration, which is an act for democratization of knowledge. Then, this led people to reflect on a wider concept of sharing and equality in economy. This brings a "new modality of organic production: radically decentralized, collaborative, and non-proprietary; based on sharing resources and outputs among widely distributed" (Benkler, 2006, p.60). Makerspaces, as a practice of social innovation, have emerged from this urge of democratic accessibility

[1] The TEPSIE research programme consists of leading research institutions from Europe and worldwide social innovation experts with the goal of building theoretical, empirical and policy foundations for the establishment of social innovation in Europe. https://cordis.europa.eu/project/id/290771/reporting

and sharing. They grow in tandem with the maker movement and provided them spaces and means to for establishing an infrastructure for socially innovative activities to flourish.

Surely certain conditions are required to be fulfilled for the creation, the implementation and the growth of social innovation. Financial support mechanisms, regulatory frameworks, cross-sectoral engagement and collaboration while capacity building, establishing cultural competence and awareness building are among them. Makerspaces can facilitate some of the conditions as it reinforces collaboration, capacity building and community (Litts, 2015).

The studies carried on social innovation generation are being evaluated from a broad perspective and focusing on the policy making. The studies on how sectors will adapt to it show variability depending on the wide range of conditions. Makerspaces have been extensively studied and analyzed as an alternative solution environment in terms of education, entrepreneurship, social change and a relatively new subject of sustainable development. Researches on makerspaces in relation with social innovation and its process are not systematically conducted and the researches stay limited. However, makerspaces can play a significant role in contributing to social innovation by increasing the dialogue and collaborations among communities and by capacity building within interdisciplinary subjects.

1.2. Maker Movement

The term "maker" was first coined by Dale Dourthey with the launch of the Make Magazine in 2005 (Celiksap, 2017). Actually, the origins of the movement were traced back to the counterculture trend of 1970s with the advent of personal computers and the indulgence with the latest technologies which was later related with the making (Anderson, 2012; Lindtner, Hertz, & Dourish, 2014). That is the reason, that in early 2000s, the term maker corresponded to hackers, tinkerers, and inventors for a longer period of time (Vossoughi & Bevan, 2014), and formed under the subculture of Do-It-Yourself (DIY[2]) (Anderson, 2012).

The phenomenon of the maker movement refers to "the growing number of people are engaged in making physical or digital artifacts for use in their daily lives, and then sharing their processes and products with others in on- and off-line communities of makers" (Halverson & Sheridan, 2014; Peppler & Bender, 2013; Martinez & Stager, 2013, as cited in Shin, 2016, p. 7). Gaining momentum in the recent decades, the launch of Make Magazine along with the first Maker Faire[3] organization have helped to draw closer attention to the maker movement (Celiksap, 2017; Shin, 2016). Both the first Maker Faire and the following ones were considered as a crucial point for the maker movement, serving as festive places for makers to communicate and collaborate within a community (Dougherty, 2012). Makers also have had a chance to share their projects with others and exhibit their inventions with the help of those faires along with

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[2] DIY or do-it-yourself is an activity of creating and repairing things by yourself.

[3] Maker Faire is an organization where makers gather and show their creations. https://makerfaire.com/

online communities and platforms such as creativecommons.org, DIY.com and instuctables.com (Shin, 2016). Therefore, both physical and online communities have contributed on spreading the maker movement.

The maker movement has been characterized with the idea of people becoming producers rather than being passive consumers while emphasizing in the learning by doing attitude (Brahms & Werner, 2013, Kalil, 2013). In academic researches, the maker movement has been investigated extensively under alternative ways of learning (Kurti, Kurti, & Fleming, 2014; Blikstein et al., 2015; Martinez & Stager, 2013; Litts, 2015) and entrepreneurial potentials (Aldrich, 2014; Browder et al., 2019). Moreover, as easy and cost-effective access to the fabrication tools and open source sharing have been potentially leading to the democratization of invention (Blikstein, 2013; von Hippel, 2005). For example, the CEO of TechShop[4], the first commercial makerspace, Mark Hatch[5] (2013) mentioned that the maker movement is "democratizing impact of access to the tools one needs to make things". Last but not least, the maker movement comprise three elements: "makers, who are involved in experimental play; the makerspace, a community of practice for makers featuring a variety of supplies; and making, activities focused around working and learning with technology (Dougherty,

[4] TechShop is the first commercial membership-based makerspace which had more than 9.000 members only in USA. It declared a sudden bankruptcy in 2017, closing down 10 U.S. locations. While TechShop in Tokyo ceased operation in 2020, the other international locations (Paris, Lille, Abu Dhabi and Dubai) still operate.

[5] Mark Hatch is the CEO and co-founder of TechShop. Also, he is the author of *The Maker Movement Manifesto*, published in 2013 and *The Maker Revolution* in 2018.

2013, as cited by Hsu et al, 2017, p. 589). In this context, makerspaces, being one of the most important components of the maker movement, deserve a closer investigation. Hence, makerspaces will be examined in this research while makers' perspectives and making activities are referred peripherally.

1.3. Makerspaces

Recent years, the maker movement contributed to the foundation of many workshop spaces for making (Otieno, 2017). TechShop, being the first commercial makerspace, was established in California in 2006 and since the beginning of 2000s, makerspaces have been rapidly growing worldwide (Smith, 2017). Looking back their historical development, it is apparent that the maker movement and makerspaces have been growing conjointly.

Makerspaces have been called with different names such as hackerspaces, maker labs, mobile makerspaces or FabLabs. They are generally considered as a collaborative working place or program at libraries or separate public or private facilities, which offer infrastructure and a community (Vuorikari et al., 2009). Actually, the variety of terminology was a result of minor differences between each other. Makerspace and maker lab are used interchangeably, which are the newest concept among them; moreover, generally makerspaces and hackerspaces grow decentralized. Hackerspaces has a longer history than the others, have stemmed from a community with similar interests, focusing on the computers and the digital fabrication (Levy, 2001). On the other hand, FabLabs have originated from the Massachusetts Institute of Technology's Center. Then, they spread this digital fabrication workshop model and network around

the world (Gershenfeld, 2005; van Holm, 2015). Yet, regarding their productions and aims, the makerspaces present similarities and they share core characteristics of physical space, both digital and traditional fabrication tools; user-driven creation; collaboration and peer-to-peer learning; cross-disciplinary integration (Dougherty, 2012; Vossoughi & Bevan, 2014). Hence, this research will use the term makerspace which connotates to a workshop space or program where fabrication tools such as 3D printers, programmable microcontrollers and/or traditional hand tools along with coding are used for making activities. While makerspaces focus on diffusing learning via facilitation, peer-to-peer knowledge-sharing, and collaboration, they "support making in disciplines that are traditionally seperate" (Sheridan et al., 2014, p.526) such as science, technology, engineering, art and mathematics (Oates, 2015). However, no makerspace is similar to another. Makerspaces show difference in their location, funding models, tools and equipment, depending on the participants (Baichtal, 2011; Davee, Regalla, & Chang, 2015, as cited by Woolls, 2018). Overall, the different areas of research have revealed that the makerspaces are found to leverage learning through making with the help of the available tools and technology and the makerspace promotes innovation and collaboration (Woolls, 2018).

Policymakers, scholars, educators, practitioners, and entrepreneurs show a great interest in makerspaces. On social level, being "simultaneously as socially transformative, educationally useful, and entrepreneurially promising", makerspaces become integral to the maker movement (Smith, 2017, p. 14) and as an establishment for civic engagement (Niaros et al., 2017; Kostakis et al., 2015). On educational level, makerspaces have been used as a learning tool in institutions such as schools, libraries and museums (Hira

& Hynes, 2018). The educational potentials of makerspaces on learning varies from the peer-to-peer learning, learning by doing and learning in collaboration; also creativity and problem solving aspects are highly mentioned (van Holm, 2015; Otieno, 2017; Blikstein et al., 2015; Hira, & Hynes, 2018). On economic level, makerspaces become the focus of entrepreneurship as the production becomes low-cost process, it enables rapid prototyping, and problem solving skills are improved through maker activities while online platforms such as etsy.com or kickstarter.com provide an alternative funding sources (Hui & Gerber, 2017; Aldrich, 2014).

Recently, the sustainable development related research also focus on makerspaces, as a practice (Hielscher & Smith 2014; Smith & Light, 2017; Kohtala, 2016). In addition to that, Schor (2010) asserts that makerspaces have a potential place for sustainable fabrication experimentation and cultivation. Apart from the scholarly research, on practical level, Pop Machina Project, developed as a part of Horizon 2020, aims to discover the links between the maker movement and circular economy to promote environmental sustainability and generate socio-economic benefits (https://pop-machina.eu/). Istanbul is one of the seven pilot cities in the project and the approach for Istanbul, which faces social integration problem due to the growth in population and immigrants, focuses on "neighborhood-based approach in order to promote an urban circular production ecosystem".

Despite the interest on makerspaces, its connection with social innovation is rarely discussed. Smith and Light (2017, p. 14) mentioned on the reporting paper of the workshop discussion for *Cultivation Sustainable Development with the Makerspaces*

that makerspaces can contribute by "organizing workshops for the social innovation of local sustainability". Makerspaces can be transformative for social innovation as they can provide sites for community building, creativity and learning (Niaros et al., 2017). Also, Smith (2017) mentioned that makerspaces could be a potential site for innovation democracy and transformational social innovation as makers can create a new technology with the help of the tools at makerspaces while open source and open collaboration play a significant role for democratization. On the other hand, Celiksap (2017) in her thesis on *Maker Movement's Effect on the Democratization of Design Process* emphasizes that the maker movement democratize the process; nevertheless, when it becomes a final product, it can be easily commercialized. There are several examples on the connection between makerspaces and social innovation. The DOIT[6] learning approach brings forward the social innovation training with makerspaces for children between the ages of 6 and 16 (Schön et al., 2018). The model focuses on the early entrepreneurial education, social innovation and makerspaces in terms of digital fabrication training. Moreover, in the TRANSIT[7] project, theory-development for Transformational Social Innovation, FabLabs and hackerspaces are seen as examples of a social innovation and they are examined as case studies for social innovation. It is clear that makerspaces hold the potential for social innovation; however, the mechanisms that bring it forward are not yet discovered systematically in detail.

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[6] DOIT - Entrepreneurial skills for young social innovators in an open digital world- is a project funded by the European Union's Horizon 2020. It is a learning programme for 6 to 16 years old children, who are expected to experience being a social innovator in mobile and fixed child-friendly makerspaces.

[7] TRANSIT is an international research project, co-funded by the European Commision, which aims to develop a theory of Transformative Social Innovation that is beneficial for research and practice.

1.4. Significance of the Study

In the literature on makerspaces, the link between social innovation and makerspaces are focusing on democratizing production and consumption, transforming consumers into producers. The TRANSIT, which composed of several institutes and research groups focused on social innovation, defines makerspaces as a social innovation itself. For social innovations to flourish, makerspaces bear the potentials to provide a site for civic engagement, community, collaboration, capacity building, and cross-disciplinary thinking. Also, as makerspaces have been promoting creativity along with providing a rapid prototyping opportunity and support to the participants, they can help improving the skill sets of individuals in terms of problem solving, technical skills or entrepreneurial skills that social innovation is being associated with (TEPSIE, 2014). Moreover, makerspaces have been acting as an intermediary organization by proving a platform for exchanging ideas and open-source data while helping to develop capacity.

When Turkey is considered within the social innovation studies, it has been involved with projects, created by global platforms and networks which are generally funded by the European Union. Turkey constitutes an interesting case as it is culturally diverse and economically unstable, citizens face many social problems from economic to cultural. Moreover, makerspaces have taken the attention of international development agencies for developing countries in terms their potentials for economic growth, locally suitable innovation and novel livelihoods (USAID, 2014; World Bank, 2016, as cited by Seo-Zindy & Heeks, 2017). This diversity is expected to reveal itself in terms of the makerspace organizations and the activities that are being practiced at those spaces. Additionally, while developing rapidly, Turkey has the largest economy in

Central and Eastern Europe. In Social Innovation Community[8], Turkey is described as a country with growing private sector and dominant state in basic industries while social innovation is growing with the support of a small number of NGOs and private sector organizations. Moreover, engagement with charity work or donation is low compared to the counterparts of Western Europe or the United States (Petrovic & Kambur, 2018). In relation with the low engagement of citizens, Ecer and Dalgic (2018, p. 122) reports in *Atlas of Social Innovation. New Practices for a Better Future* that "many socially innovative projects will never reach an advanced stage due to the innovators' inability to remain committed to the project in the face of financial insecurity". Moreover, one of the focused subjects on Istanbul Innovation Days in 2017, annual meeting hosted by the UNDP in collaboration with NESTA[9] and McKinsey[10], which aims to accelerate learning about emerging trends while exploring innovative approaches to development and policy making, was gaining knowledge in current trends for social innovation in public sector both in the context of developed and developing countries. At the same event in 2018, in the opening speech of Mirjana Spoljaric Egger mentions that "collaborative experimentation and critical discussion are essential for shared learning and for finding new solutions". According to the hypothesis of this research, makerspaces bear the potentials for providing the collaborative environment that Ms. Egger mentions.

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[8] Social Innovation Community (SIC) is a social innovators' community in Europe, which is a Horizon 2020 funded programme, aiming to increase knowledge and capacity of networks while providing support for solving public challenges. www.siceurope.eu/countries/turkey

[9] NESTA is an international innovation foundation, based in the UK. https://www.nesta.org.uk/

[10] McKinsey is a management consulting firm, operating in 65 countries. https://www.mckinsey.com/#

In the insight report of Social Ecosystem in Turkey by SIX[11] (2018), participants highlighted topics of collaboration within multiple sectors, methodologies for cross sector adoption of social innovation, capacity building of individuals and perception of social innovation in Turkey. While Turkey offers an intricate environment for social innovation as the sectors are not at the similar levels of social innovation adaptation and wicked problems arise due to the developing country context, makerspaces draw attention for their socially innovative potentials. Understanding the context of makerspaces in Turkey is the first crucial step for revealing the potentials and the problems they face from the perspective of social innovation.

Therefore, empirical data on makerspaces can be helpful to understand how makerspaces are related with social innovation and in which ways makerspaces contribute to the social innovation process. Taking into account of exploratory nature of this research, aimed to be addressed by a qualitative study, Turkey - a developing country context, can be another contribution of the study.

1.5. Research Problem and Scope

This research aims to understand "In which ways do makerspaces contribute to the process of social innovation?" Within the limits of this wide problem, the main concern of this research is to explain whether makerspaces may create an efficient and

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[11] SIX is a social innovation exchange network, aiming to connect people and organization across sectors while enabling the global community they built to learn from each other and increase their capacity. https://socialinnovationexchange.org/

productive source for social innovation. At the same time, it aims to document how the makerspaces operate. Makerspaces, growing in tandem with the maker movement is claimed to be crucial to the democratization of culture through social innovation. Hence, the study focuses on Turkey to conduct case study, which provides both material and existential resources for the emergence of makerspaces.

The case study consists of 4 makerspaces that are established by the individuals who are pioneers in the maker movement in Turkey. The objective is to define, determine and analyze organizational structures of the makerspaces, their relationships with the stakeholders and their methods of diffusion along with the perspectives of makerspaces on social innovation and the structures of the socially innovative projects. Within this scope, a case study, involving semi-structured and in-depth interviews with seven participants from those makerspaces, and additionally two from maker groups was conducted. Even though those maker groups are not embodying the makerspace context of the study while they lack of structured organizational models and sustaining financial models, they are included as they have the potential to provide valuable data especially in terms of community-building.

In the light of the research, makerspaces have the potential to contribute to social innovation process as makers have a good mastery of production process, design thinking and innovation process while at the same time collaboration and sharing are inherent to the maker culture. Moreover, social innovation occurs in process and in addition to the stages of social innovation process, there are mechanisms that need to be actualized. Makerspaces have the potentials to become a site for social innovation

process as they have established a wide range of collaborations which enable them to work in various communities and with a wide range of actors from different sectors, and maker activities and education provide the necessary tools for capacity building and empowerment of the society. With this study, defining the social innovation and its process can increase the application of makerspaces in social innovation framework.

In the study, extensive literature review on social innovation will be covered to define the term in the Chapter 2, which will be the criteria for evaluation of socially innovative activities that makerspaces conduct. To explore the research question of this research, the social processes will be profoundly covered in the section 2.2.. *The Open Book of Social Innovation: Ways to Design, Develop and Grow Social Innovations* by *Murray, Caulier-Grice and Mulgan's (2010)* will provide the guideline in terms of social innovation process while briefly mentioning the differences of the social innovation process, defined in the literature. The purpose of the research focuses on exploring makerspaces in terms of social innovation, based on 4 makerspace and 2 maker group cases, including 9 in-depth interviews along with other qualitative data instruments. The methodology will be explained in detail in the Chapter 3. The data from the interviews will be critically evaluated in terms of makerspaces' organizational and diffusion models in the Chapter 4. The findings of the interview data will be discussed in the light of the literature along with cross- analysis of the cases, which will be discussed to better understand the research question, focusing on the overlapping areas, the problems and the potentials that the makerspaces face in social innovation process in the Chapter 5. In the final chapter, the research will be evaluated in a holistic way, comparing the practices and the literature.

CHAPTER 2. DEFINING THE SOCIAL INNOVATION

Social innovation and theories about its process constitute the theoretical framework of this research. Hence, this section aims to explore profoundly the definitions and meanings of social innovation as discussed by scholars while introducing the mechanisms that bring it forward.

In the section 2.1., how social innovation is being defined by the scholars will be examined while emphasizing that there is still a lack of widely accepted definition of social innovation. The section 2.2. focuses on the stages of social innovation. After briefly introducing the different social innovation process, suggested by the scholars, *The Open Book of Social Innovation: Ways to Design, Develop and Grow Social Innovations* by Murray, Caulier-Grice and Mulgan's (2010) is adopted for the social innovation process for this research. Each stage is explained in detail. In the 2.3. section, cross-cutting features of social innovation which cannot be evaluated under the definition or the process, but play a crucial role for the social innovation process will be introduced.

2.1. Definition

Interest in social innovation has been increasing both in the public sphere, the policy making and the academia (Adams & Hess, 2010; Avelino et al, 2019; Van der Have & Rubalcaba, 2016). Even though the academic studies on social innovation have gained momentum in the last two decades, it is not completely established as a research field (Haxeltine et al., 2016; Van der Have & Rubalcaba, 2016). Its roots go back to various disciplines in social science (Westley, 2013), beginning with the economist Joseph

Schumpeter, who brings forward the social dimension to innovation and the sociologist Ogburn, making a distinction between "technical and social intervention" (Cajaiba-Santana, 2014). Moreover, the researches on social innovation have been carried out under diverse disciplines such as social entrepreneurship (Philips et al., 2015; Fleischmann, 2013; Dees et al., 2002; Short, et al., 2009); management (Saul, 2011); policy making (Adams & Hess, 2010) while the need to differentiate the studies on social innovation from innovation studies is being stressed out. Even though an activity is not defined as a social innovation, it might involve a socially innovative one. The socially innovative activity can be carried out under social entrepreneurship and social enterprise. Even though these terms are distinct, they are also firmly connected to the notion of social innovation. The TEPSIE[8] project (2014, p. 32) – whose goal is to build the theoretical, empirical and policy foundations for establishing social innovation across Europe- brings forward that "social innovation is much broader than either social enterprise or social entrepreneurship – but may overlap with one or the other or both. For example, a social entrepreneur may set up a social enterprise which delivers a socially innovative programme". The TEPSIE research project plays a crucial role in the social innovation studies as it examines the system of social innovation from a diverse points of views while focusing on the barriers, preventing the social innovation to reach its potential and examining the areas that need for further research extensively.

[8] TEPSIE programme consists comprehensive body of works on theoretical, empirical and policy foundations for building social innovation in Europe. The TEPSIE consortium comprise of networks of scholars, policy makers and practitioners not only from Europe, but around the world, which is crucial for mutual learning on social innovation across countries while focusing on the diversity element of it.

Social innovation as a term is still not being broadly consolidated among scholars. The variety in definitions and theories of social innovation has been mentioned by some scholars, concentrating on the fact that due to the popularity of the term, it lacks predominantly accepted definition (Harrisson, 2012; Franz, Hochgerner & Howaldt, 2012; Hochgerner, 2012). Caulier-Grice et al. (2012) explains the reason why there is no commonly accepted definition as social innovation is primarily being a practice-focused area. The ambiguity of the term is even considered to result in inadequacy for the academic development of the field (Pol & Ville, 2009). Therefore, it leads to definitions being emerged through people doing things rather than academic reflection (TEPSIE, 2014).

The ambiguity of the term makes it even more difficult to accumulate knowledge, and in some cases, to clarify the implementation processes. Hence, some studies attempt to clarify the understanding of social innovation by extensive literature researches and by profoundly analyzing and categorizing the studies carried out for meaningful patterns (Van der Have and Rubalcaba, 2016; Carvache-Franco, 2018; Anderson et al., 2014). Actually, that was the urge for the TEPSIE consortium in Europe to gather the leading research institutions and experts together to build social innovation across Europe by building the theoretical, empirical and policy foundations (TEPSIE, 2014).

Murray, Caulier-Grice and Mulgan (2010, p. 3) emphasizes that both goals and tools of social innovations are social. They define that "social innovations as new ideas (products, services and models) that simultaneously meet social needs and create new social relationships or collaborations." In TEPSIE consortium (2014, p. 14), the

researchers have defined social innovation "as new approaches to addressing social needs. They are social in their means and in their ends. They engage and mobilize the beneficiaries and help to transform social relations by improving beneficiaries' access to power and resources".

Mumford (2002, p.253) uses the term as "the generation and implementation of new ideas about how people should organize interpersonal activities, or social interactions, to meet one or more common goals." Anderson et al. (2014) refines the term with an extensive discussion based on the literature brings forward the idea and impact of "equality, justice and empowerment" while defining social innovation as novel solutions to social threats.

Cajaiba-Santana, G. (2014) brings forward that social innovation can be conceptualized as a collective creation of new legitimatized social practices aiming at social change, focusing on inter-relationship between agents and social agents. Hexaltine et al. (2016, p. 20) also emphasizes on the role of actors by extending even further "as any collection of individuals, initiatives, networks and/or fields" and he claims that "social innovation involves different types of actors interacting together in groups, networks and other organizational forms to reproduce current social 'forms' and 'patterns' and to also 'innovate' new ones".

Mulgan et al. (2007, p. 8) defines the term as "innovative activities and services that are motivated by the goal of meeting a social need and that are predominately developed and diffused through organizations whose primary purposes are social". This definition

emphasizes the purpose factor of social innovation and it differentiates social innovation from business innovation while acknowledging cases that sit in between. In addition to that, Saul (2011) brings the dimension of corporate strategy to the social innovation and claims that creative strategies for solving social problems, adopted by corporations, can lead to social innovation while it can bring business growth.

Regardless of the dimensions, focusing on the product, empowerment or the process, many of those definitions have focused on significant common conceptual factors, as suggested by Van der Have and Rubalcaba (2016, p. 1932) : "a change in social relationships, -systems, or -structures, and such changes serve a shared human need/goal or solve a socially relevant problem,". In addition, these definitions also include the element of newness; it can be a new idea; new process, new method or something else that brings a new way of doing. To sum up, the social innovation descriptions briefly contain the role of an agency and its changing roles (social innovation can be done by various parties); a social problem or need; a novel solution.

2.2. Process

Scholars focus more on attempts to define the social innovations than its mechanisms and practices (Borzaga and Bodini 2012). There are several categories for staging the process of social innovation, discussed in the literature. The process of social innovations are generally outlined differently with minor changes in the literature. The stages mentioned are highly contextual, not linear and, not standard either (Turker & Vural, 2017). However, it is commonly accepted that these stages occur in an iterative process while there might be overlapping areas from time to time, depending on the

context (Kohli & Mulgan, 2010; Murray et al, 2010). The context might result in the changes in processes. For instance, the policy making processes are not focusing on the scaling and diffusion stage, as public policy inherently includes them (Minks, 2011). Even though different models have been researched and applied, social innovation processes share certain characteristics and a pattern regardless of their form or the settings. There are several studies on this matter. European Commission in its 2013 Guide to Social Innovation report, in which the role that the Europe's public institutions can play for the Europe 2020 vision. While admitting the overlapping areas, common patterns of social innovations are defined as prompts (problem definition); proposals (ideation); prototyping; sustaining (turning it into practice or implementation); scaling and systematic change. Meanwhile, Mulgan et al. (2007) describes the four stages of social innovation as generating ideas by understanding needs and identifying potential solutions; developing, prototyping and piloting ideas; assessing then scaling up and diffusing the good ones; learning and evolving. Social innovation starts with the awareness of the need which leads to new possibilities and ideas. When an idea is proven to work in practice with the prototyping process, it can grow through various channels such as "organic growth, replication, adaptation or franchising" (p. 23). Buckland and Murillo (2013) similar to the Murray et al. (2010) with nuances identifies six stages of social innovation: diagnosis; ideation and possible solutions; prototyping and piloting; business model; expansion and diffusion; systemic change.

The Center for Social Innovation (ZSI), whose goal is to enhance the studies and applications of innovation, brings forward the 4i process - idea (problem and solution),

intervention (conceptualization), implementation, impact, which has been transformed to training and teaching modules (as cited by TEPSIE, 2014).

2.2.1. Stages of Social Innovation

Even though there is an ambiguity of the term and the difficulty to setting a pattern for the process, the studies reveal that social innovation shares a common understanding about its practice and mechanisms. This pattern can be briefly described as to identify, define and select the solution; to plan for and implement the innovation; to evaluate the social innovation; to scale and diffuse successful innovations (Minks, 2011). In this matter, *The Open Book of Social Innovation: Ways to Design, Develop and Grow Social Innovations* by Murray, Caulier-Grice and Mulgan's (2010) attempts to provide a guideline and establish a standardized pattern to understand each stage with comprehensive explanations and examples. According to them, the social innovation has six stages: "1. Prompts, inspirations and diagnoses; 2. Proposals and ideas; 3. Prototyping and pilots; 4. Sustaining; 5. Scaling and diffusion; 6. Systemic change". The first step involves the diagnoses of the social problem in detail while generating ideas is covered in the second one. The third stage is where the most iteration occurs. In the fourth and fifth stages, the sources are managed in a sustainable way and the social innovation is aimed to be diffused to a larger population. The last stage is about groundbreaking change and transformation, resulting in systemic change. This section will focus on these stages set by Murray, Caulier-Grice and Mulgan in tandem with relevant literature, as they will constitute the guide for the research analysis.

2.2.1.1. Prompts, Inspirations and Diagnoses

Identifying and defining the social problem is the first crucial step. It starts with the need that is not being met by the current mechanisms such as the government and the market (Mulgan et al., 2017). Whether apparent or not, these problems can be identified by "paying attention to what bugs you and other people. Like the princess and the pea, innovators have to pay attention to hidden problems, things that get swept under the mattress" (Nalebuff and Ayres, 2003, p. 15). The problems, of course, are more complex than that. Meticulous research along with data play an important role to understand the needs and the problems they bring about. This stage intensively focuses on the redefining the problem which is expected to help identifying the workable solutions for the mentioned problems. Also, how a problem is addressed already has an impact as it has the power to change people's perspective (Minks, 2011).

Murray et al. (2010) brings forward some methods in order to redefine the problems. While triggers that demand action on an issue and inspirations help making people believe that action is possible, applying research and data are fundamental to make the problems to be recognized. Making a problem visible and bringing the attention to the problem thorough campaigns and media coverage lead to discover the underlying cause of the problem.

2.2.1.2. Proposals and Ideas

Once the problem is defined, possible solutions reveal themselves. However, it is an intricate process as usually ideas are not fully formed in the beginning and ideas are needed to be adjusted (Mulgan et al., 2007). Methods to encourage creativity are

adopted to think about new possible solutions. While the field of design, often called "co-design" offers methods that bring people together to develop possible solutions, adaptations from other fields and connecting various elements into a new one can create unique solutions (Murray et al., 2010). Moreover, open innovation, focusing on "collaboration, sharing, self-organization, decentralization, transparency of process, and plurality of participants" has become widespread with the help of internet, enabling the participation of people in a meaningful way and at a relatively low cost (Ibid, p. 38). At this stage, think tanks and design labs play a significant role in terms of innovative solutions as they bring various perspectives to the table. Minks (2011, p. 34) mentions that “For social innovation to be effective, a design process – any well thought out design process – needs to be implemented in order to identify comprehensive solutions to problems in which people will be invested in helping implement."

2.2.1.3. Prototyping and Pilots

Prototyping is a key element for innovators as for an idea to work, as more than one trial is generally needed (Mulgan et al., 2007). The social innovation needs constant improvement, therefore putting the idea into practice quickly is a commonly utilized practice (Murray et al., 2010). With the help of quick prototyping and pilots, it keeps the process low cost and fast while the feedback loops increase the success of the idea. Also, the demonstration of prototypes can be helpful for an idea to be adopted by others, which is closely related with the scaling (Minks, 2011). With the help of prototyping and pilots, what is needed for the social innovation to process is also demonstrated such as “the feasibility of making the product, delivering the service, how

to deal with particular issues, what the economics look like, and how it could be made cheaper" (Murray, et al., 2010, p. 50). Through prototyping and pilot, overall, the challenges that can be faced as well as the possible outcomes are aimed to be revealed for the success of the social innovation in the long run.

Prototyping and pilots are the implementation of an idea and according to the innovation, it can diversify. For instance, 3D printers have been used for product innovations in business as they enable to turn ideas into a tangible thing. Depending on the sectors, the methods can diversify while sectors can adopt methods from each other. For instance, incubators which are widely used in business have started to be adopted by the public sector and NGOs (Mulgan et al., 2010).

Brown and Wyatt (2010) claims that prototyping plays an important role especially for developing countries as "the lack of infrastructure, retail chains, communication networks, literacy, and other essential pieces of the system often make it difficult to design new products and services". Moreover, they suggest, insights and prototyping which are immanent to design thinking are effective ways for breaking away from the pre-assumed thinking that can be a barrier for finding effective solutions.

At this stage, the need to access to relatively free circulating funding becomes essential for ideas to thrive. The funding options can diversify extensively; grants, prizes, incubation funding are among the mostly used methods.

2.2.1.4. Sustaining

After rigorous trial and errors, only few social innovations will retain. At this stage of sustaining, evaluation becomes crucial as it can explain the social innovation to the different stakeholders while providing answers to their concerns and it can ease the problems arising during the processes (Weaver and Kemp, 2017). Various evaluation models and evaluation data can be used both for the process and the outcomes. Even though the evaluation methods and practices will not be explored in detail in this research, it is important to note that it plays a powerful role for social innovation processes.

Murray et al. (2010) explains the key elements for social innovations to sustain as a business model, a governance model, financial sources, relational capital, organization and management models, operational model. These reveal the details of economic or business plan, answering the questions of how it will be established, by whom, with what inputs and capital, and how it will generate income, which in return will increase the chance of sustaining the social innovation.

Even though it is more difficult to raise funding at earlier stages, at this stage, financial tools are required for the sustainability of the operations in lined with the value of the social innovation (Murray et al, 2010). In addition to the financial capital, relational capital becomes just as crucial as it can help attracting support and resources outside of the social innovation (Ibid).

2.2.1.5. Scaling and Diffusion

The scaling and diffusion stage can be achieved through organic growth or through mechanisms such as franchising, licensees, replication and adaptation (Mulgan et al., 2007; Murray et al., 2010). Even though scaling and diffusion are similar concepts and happen simultaneously, they have different connotations. While scaling focuses implementing the social innovation in new areas, diffusion means the communication and spread of it through sharing (Minks, 2011). Moreover, for successful social innovations to spread, they generally "need to be mainstreamed through the market or with support from the state" (TEPSIE, 2014, p.35). Each sector needs different mechanisms for this phase; however, it is clear that support and diligent strategy is needed for an idea to scale. Also, as of the sustaining stage, metrics can be crucial for deciding which social innovations deserve to scale up; and there has been great improvements around metrics "from tools to judge the impact of a particular project or programme to meta-analyses and assessments of much larger processes of social change" (Murray et al., 2010, p. 6). One of the most commonly used metrics focus on social impact assessment methods and Social Return on Investment (SROI, developed by REDF[12]), which help revealing the value of the social innovation in terms of economic and social benefits for the stakeholders. According to the TEPSIE report (2014, p. 18), the evaluation is also important for in a variety of ways. These includes "acquiring a blueprint of what has or hasn't worked in similar interventions; obtaining greater acceptance of the intervention, assuming evaluation results confirm valuable

[12] REDF is a venture philanthropy, investing on social enterprises which employ and empower people overcoming barriers to work. https://redf.org/

impacts and outcomes; facilitating access to funding through public and private sources; increasing the potential for replication of the intervention, based on the demonstrated reliability".

For this stage, partnerships and networks are also becoming more and more important for the success of the social innovations. As a matter of fact, "most effective social innovations cross sector-boundaries in some way, many times through collaborative partnerships" (Minks, 2014, p. 37).

2.2.1.6. Systemic Change

Scaling and diffusing a social innovation will not result necessarily in systemic change. Systemic innovation requires a large scale of acceptance and involvement from different people, organizations and sectors and they are transformative by this means. This also differentiate it from product and service innovations. Moreover, this stage brings extensive changes as it changes the concepts and ways of thinking along with the economic flows. Even though they can be triggered by a disruptive technology or a crisis, they are usually slow-paced as changing infrastructures, behavioral patterns and cultures take time (Murray et al., 2010). For systemic change, regulatory frameworks are required for the recognition of the social innovation principles in law while to mobilize the support, there is a need for progressive coalitions and social movements. At the same time, social movements become one of the most vital element of systemic change as it involves different actors while mobilizing a huge number of people.

According to TEPSIE (2014), “Systemic innovation involves the exploitation of a set of interconnected innovations where each is dependent on the other, with innovation both in the parts of the system and in the ways that they interact” (p. 35). Therefore, there is a need for innovations which interact with each other at multiple levels in a complementary way. It also requires a systemic approach for innovations to become socially transformative such as “a low carbon economy” or “the co-production of public services” rather than focusing on the scaling up the social innovation. (Ibid, p. 35).

2.3. Cross-cutting Features of Social Innovation

In addition to the social innovation description and social innovation process, social innovations also share some cross-cutting features in the literature that cannot be simply classified under the description or the social innovation process. Briefly touching upon those features are beneficial as they play a significant role for social innovations to be successful. Moreover, those cross-cutting features provide means for the emergence of makerspaces.

One of the mostly mentioned elements is collaboration and partnerships, especially the cross-sector collaborations. Social innovations involve different actors and usually collaborations overreaching the all three sectors (public, private and third) along with ordinary citizens bring out the most successful results (TEPSIE, 2014). One of the reasons behind it is because collaborations enable people to think in new ways, which can be crucial for finding new solutions to the problems. Moreover, collaborations can be leveraged as a diffusion strategy as the spread of information through the collaborated networks can be achieved in an efficient and easy way and it helps

mobilizing the resources and other partners for the diffusion (Minks, 2011; Cajaiba-Santana, 2014). Closely related with the collaborations, another element of social innovation is divergence. Especially design field related methods along with participation and engagement can be adopted as they focus on bringing people from diverse backgrounds. As the social innovations deal with the complex social problems or needs, divergent thinking approach is almost necessary for problem solving (Davies, 2013). In order to solve complex problems, find innovative solutions and implement them, capacity building is considered as a crucial factor in social innovation both in the individual and organizational levels. By investing in the people's skills and resources, raising the capability and the motivation of the people can increase the employment and the voluntary and entrepreneurial activities (Millard & Carpenter, 2014; Adams & Hess, 2010). Moreover, it will be critical for the development and growth of the sectors (Murray et al., 2010).

CHAPTER 3 METHODOLOGY

The aim of this study is to examine in which ways makerspaces, situated in Turkey, contribute to the social innovation process. In the chapter 2, social innovation is defined as a phenomenon which stems from a social problem or need, involves the role of an agency and its changing character, and brings a novel solution to the mentioned

problem. The social innovation process involves the stages: 1. Prompts, inspirations and diagnoses; 2. Proposals and ideas; 3. Prototyping and pilots; 4. Sustaining; 5. Scaling and diffusion; 6. Systemic Change, as suggested by Murray, Caulier-Grice and Mulgan's (2010). Moreover, social movements can be a catalyst for social innovations to emerge as they mobilize a huge number of individuals and involve actors from diverse backgrounds/ sectors. In this study, makerspaces which have been growing in line with the maker movement, associated with blurring the lines between consumption and production, are suggested to be potential sites for social innovations.

To test the research question, case studies are selected in Turkey, which involve semi-structured, in depth interviews with 9 participants from four makerspaces and two maker groups. As a developing country, Turkey faces economic and social problems while it is growing rapidly. Compared to the developed countries, where social innovation studies focus, Turkey, as of developing countries, need different mechanisms for social innovations to emerge while it is expected to face different problems. Therefore, the study employed qualitative methodology instruments to examine the makerspaces in the light of social innovation process. The makerspaces were chosen from the pioneers of the maker movement in Turkey with a snow-ball method.

This chapter includes the presentation of methodology, focusing on the reasons why the qualitative methodology is chosen for the study along with the challenges it brings; what kinds of research instrumentation are used (3.1.), the procedure of data collection

(3.2.) and how the data analysis is actualized (3.3.). In the following chapter, analyzed data will be discussed in detail in accordance with the literature.

A qualitative methodology is adopted to discover the makerspaces in Turkey in terms of their structures, relationships with stakeholders, needs, motivations and their perspectives on social innovation. There are several reasons for adopting the qualitative methodology. One of the reasons is to understand the social relationships while discovering the perspectives of stakeholders in the given context, as mentioned by Flick (2009). Therefore, studying and comparing the makerspaces in Turkey have provided the support for the comprehensive understanding on how makerspaces' organizations are constructed, how makerspaces construct relationships with other organizations and diffuse, and the reflections of these relationships on the social innovation process. Another reason is that the studies on makerspaces in relation to the social innovation is scarce, which makes the qualitative methodology an appropriate choice of research as Yin (2014) suggested that with the help of empirical inquiry as a case study, a contemporary phenomenon and context that are not clear are investigated. Also, supportively Dickerson (2015, p. 32) mentions in her thesis that there is no comprehensive and accurate database on makerspaces' "inventories, memberships, human and financial capital, organizational structure, participant inventions, or product commercialization", which makes the qualitative research a preferable option.

In addition to the advantages of the qualitative methodology, it also brings certain challenges due to the effect of the researcher on the study along with the some degree

of generalization and abstraction in the analysis process. Malterud (2001) mentions that “a researcher's background and position will affect what they choose to investigate, the angle of investigation, the methods judged most adequate for this purpose, the findings considered most appropriate, and the framing and communication of conclusions" (p.483-484). This requires the researcher to be reflexive at each step of the research process. Also, as the study is carried out in the context of Turkey, the findings of this research bear the potential risks of transferability, “the range and limitations for application of the study findings” (Ibid, p.484).

3.1. Instrumentation

The study adopted various research instruments. The data was predominantly collected through semi-structured interviews which provided the researcher flexibility to guide the interview. In addition to this, web-site and social media contents and observations from the site visits were employed as instruments. The interview questions were open-ended, which enabled the researcher to customize the questions while maintaining the similar structure for the all participants. The interview questions were designed to have a deeper understanding on organizational information, process of makerspace projects and makers' perspectives on social innovation. Organizational information questions focused on the historical background, organizational structure, business and revenue models, audience of the makerspaces, relationships with different stakeholders, physical features such as inventories and location. Questions on the projects were designed in accordance with the literature on social innovation process. Moreover, with the initial data collection, the questions were designed to refer to the socially innovative projects that the makerspaces have conducted. For the last part, the participants were asked to

define the social innovation and whether or not there is a relationship between makerspaces and social innovation, and how.

The website and social media content, if applicable, were analyzed in order to examine: what kinds of tools and services are provided by the makerspaces; who are the particular audiences such as children, corporations, etc. and the details of the projects. The observation of the site visits helped to examine the physical conditions and the dynamics of the space.

3.2. Collecting the Data

As Corbin and Strauss (2008) stated, the questions were formulated from the literature at the start of the research. Initial interviews were conducted in November, 2019, during which the structures of the makerspaces and the socially innovative projects at the makerspaces were aimed to be discovered. After the initial visits, research questions were analyzed and revised in accordance with the social innovation literature for the data collection which was actualized between January and March, 2019. The exploratory research preceding the data collection started with attendances to electronics and design thinking workshops in one of the makerspaces and with an attendance to the Lecture Series on "Maker and Social Innovation" talk by Zeynep Karagoz at Orient Institut Istanbul in December, 2019.

For the case studies, the interviews were conducted with the founders of the makerspaces or with employers/ participants of the established organizations. Seven interviews from four makerspaces along with two interviews with two maker

communities were conducted. Each interview lasted between 40 to 60 minutes. The makerspaces were selected among the pioneer makerspaces which were established with the start of the maker movement in 2014 in Turkey. The maker communities were included in the study for their community building capabilities; however the data is not presented in the Chapter 4 as the study is focusing on the sustainably revenue generating makerspaces.

The participants were contacted through an e-mail or phone. The e-mail included a brief introduction of the researcher, the purpose of the study with a request of an interview. At the beginning of the interview, the participants were informed about the process and the use of the voice record, and they were asked to sign the voluntary consent form. Six interviews took place in person at the makerspaces, one interview was conducted via a phone call, and two interviews were conducted through video calls.

The researcher changed the order of the questions, included additional questions appropriate to the flow of the interview during the interview. The voice recordings were transcribed, encrypted and anonymized for data analysis. All interviews except one were individual interviews. One of the interviews was established as a group interview with two participants.

3.3. Data Analysis

Data analysis is constituted as a process of generating, developing and verifying concepts which is built over time and with data collection (Corbin & Strauss, 2008).

After the initial interviews, the data analysis process started, which was iteratively done along with the data collection process.

Raw data is classified under themes and subthemes. These themes and subthemes emerged from the main question of the research and the literature review based on social innovation. Accordingly, the analysis of the research will follow the subsequent structure, designed to present the data within the theoretical framework. Based on the literature, how makerspaces are defined, what their characteristics are and how they fit into the social innovation process through their activities have shaped the themes and sub-themes. Similar to the social innovation process, the analysis themes may not be linear, may occur concurrently.

A) Defining makerspaces in Turkey
    a) Organizational models of makerspaces
    b) Financial dynamics
    c) Capabilities
B) Diffusion models of makerspaces
    a) Stakeholders
    b) Communication channels
C) Cross-case analysis
    a) Maker's perspectives
    b) Cross-correlational inquiries

Both the makerspaces and the maker communities are encoded during the transcription process. The chart below demonstrates the makerspaces' codes along with their brief

introductions. Below the chart, descriptions of makerspaces will be introduced in terms of the general strategy they have adopted.

Figure 1. Makerspace Codes

Makerspace A	Educational space
Makerspace B	Embedded facility to the co-working space and design studio
Makerspace C	Co-working space
Makerspace D	Lean startup with mini makerspace
Maker Group A	Urban hacking community
Maker Group B	Event-based community (on-hold)

Makerspace A – Educational space

Started as an experience design agency in which they were using technologies such as IOT or 3D printing, with the maker movement, they started working on the movement on voluntarily. The social responsibility project that they started, inspired from the Enable the Future, is now operating as an NGO; connecting makers and voluntaries around the country with the children with ABS syndrome for creating 3D printed personalized mechanical hands or arms. In addition to this, the makerspace operates in two brands one of which is specialized in educational programs for the children at the age of 5-14. They are a part of FabLab Network and IAYCE (International Alliance of Youth Coding Educators). Along with the common area where fabrication tools are mostly demonstrated, there are three classrooms and one office space.

Makerspace B – Embedded facility

Makerspace is an embedded facilitation to a trandsciplinary innovation platform that includes a co-working space, design studio and a makerspace along with a curated community. The platform is focused on creative industries and they carry out projects in global scales. Even though the maker area is used to be called as a makerspace, it is currently described as a prototyping lab.

The makerspace is utilized by the people in the co-working space or in the projects of the platform for prototyping purposes. The community members have backgrounds in diverse subjects such as design, sociology, communication, engineering and collaboration among them are highly supported. The makerspace is organizing Designer-in-Residence programs and theme-based workshops. While it is a part of FabLab Network, it has a wide range of physical and digital prototyping equipment.

Makerspace C – Co-working space

It is a co-working space for freelancers who are mostly working on software and hardware projects. The individuals generally work on experience design projects or as educators. The space is also shared with NGOs and an art collective. The co-working space does not have any administration or memberships, rather it is positioned as a space for sharing resources and there is an “organic structure” as described by the participants. They describe themselves as a half hackerspace and a half makerspace. Its location is situated in one of the vibrant neighborhoods in Istanbul, which enables the makers an easy access to other ateliers and resources.

Makerspace D – Lean start-up

The makerspace is focused on corporate services. They started working on the maker movement on voluntary based and built a community on social media channels by creating contents. They used to have an open-to-public makerspace operating in monthly subscriptions. Then, it was pivoted to corporate services, focusing on private corporations. The participants from the Makerspace D – lean-start-up– have backgrounds in corporate consultancy, which led to the business model pivot. Currently, there is only a mini makerspace at the office, and for bigger productions, they have a space in another location in PERPA Commercial Center while they build makerspaces at different locations as a service.

Maker Group A – Urban hacking community

The maker community started in 2015 with the idea of doing public restorations in a fun way. It focuses on urban hacking and public interventions. The goal is to make the restorations visible to the public. The core group consists of five people, one of which has recently become a full time. They are partnering with private corporations and local municipalities. They have initiated a social project: a network of public places where people can use 3D printers for free, called Print4Purpose. They aim to open up a co-making space.

Maker Group B – Event-based community

The maker community is based in Ankara, the capital of Turkey. They organized monthly meetings and events, focusing on maker education. In October, 2017, they

organized Ankara Maker Festival. They wanted to become a cooperative; however, due to the voluntary-based structure and division of opinions, the team of fourteen came apart. Even though the community is not actively organizing any events, the community stills keeps their connections.

In addition to the cases, in the Appendix A, there is a list of makerspaces operating in Turkey. The list does not include the makerspaces at schools, at corporations or at public spaces.

CHAPTER 4 CASE STUDY AND ANALYSIS

The analysis of research consists of three phases. The first and second phases consist of attempts to understand the context of makerspaces in Turkey. How they function as an organization and how they diffuse are expected to lay the ground for understanding the mechanisms they develop while revealing the system they operate in. As each sector and organizations have unique backgrounds and contributions for social innovations to emerge, for that matter, it is crucial to understand the context that the makerspaces operate. Moreover, this analysis is expected to shed light for the last phase on analyzing the problems and potentials of makerspaces in the social innovation process in the Chapter 5.

For that matter, the section of Defining Makerspaces (4.1.) in Turkey will focus on the organizational models through an analysis of their organizational dynamics, financial dynamics and the capabilities of the makerspaces. As interrelated with this, the section of Diffusion of Makerspaces (4.2.) will discuss the relationships with the stakeholders and the communication channels of the makerspaces to discover how makerpaces operate as it is expected to reveal the relationship between the makerspaces and the social innovation process. The stakeholders play an important role as the social problems that the makerspaces work on are stemming from the problems that the stakeholder faces. Moreover, the stakeholders enable makerspaces to diffuse the knowledge while promoting their growth. The relationships within these sections are not linear, can be and interrelated and intercorrelated.

4.1. Defining the Makerspaces

4.1.1. Organizational Models of Makerspaces

Organizational models of the all makerspaces in the study have shown unique features with similarities in between. Moreover, these makerspaces have adopted different strategies and exceeded the commonly defined concept of makerspace - a workshop place with fabrication tools. The models they adopted can be categorized under a lab embedded to a facility, co-working space, educational space, lean start-up where maker area can be embedded or embodied. These unique models of the makerspaces have made it extremely difficult to find organizational patterns for the study.

Each makerspace has a unique organizational model and unique setups. When defining a makerspace, it has been used as an umbrella word to indicate a workshop area or a program which involves fabrication tools such as vinyl cutter, 3D printer and CNC. Curiously, one of the makerspaces (Makerspace D – lean-start-up) in the study do not have an actual production area any more, but a small counter with basic fabrication tools and a network of production areas. Also, they are building makerspaces at various scales and at different locations. Two of the makerspaces (Makerspace B – embedded facility – and C – co-working space–) are organized within a co-working space even though they are highly differentiated from each other. While Makerspace B – embedded facility – is working as an embedded facility to the co-working space for a curated community and the design studio, Makerspace C is a co-working space for freelancers who share resources and the maker area and the co-working area is compound. Makerspace A – educational space - is organized as an educational space where there are classrooms in addition to the common maker area.

Organizational dynamics are examined under hierarchical structure and openness to public. The information is gathered extensively from the website and social media contents of the makerspaces along with the interview data.

Dickenson (2015, p. 24) mentions that “smaller organizations is much less likely to have a hierarchical organizational structure than a larger one”. In this study even though the size of the organizations can diversify, the criteria was to include the pioneer makerspaces which were established with the start of the maker movement in Turkey. Except Makerspace C – co-working space–, the makerspaces were managed in a hierarchical way with an organizational schema. In addition to the operational core team, Makerspace D – lean-start-up– has a network of educators, engineers or experts who they can employ according to the project. Makerspace C – co-working space–, on the other hand, has built an organic system which is functional, pragmatic concept, driven by "the rationale of nondefinition “as stated by Burns and Stalker (1961, p. 107). One of the participants from Makerspace C – co-working space– is defining the space as “there is an intention of building relationships and spending time together in here.” There is no opening or closing hours and the maintenance of the space is managed whoever is more available at that time.

None of the makerspaces is entirely open to public. In the spectrum of open to close, the makerspaces in this study are operating as half-open or closed systems in terms of individuals’ having an access to the fabrication tools. However, the makerspaces in the study cannot be categorized under one way or another as they fluctuate in the spectrum.

Half-open systems involve public participation under certain conditions; for instance, Makerspace A – educational space - offers educational programmes to children between the age of 5- 14, through which children learn the fabrication tools and create their maker projects. Makerspace B – embedded facility – has adopted a system which is closer to the closed systems. For a short period of time, they tried to open up the space to the students; however, the absence of students upon registration resulted in mix-up in the quota. Right now, the makerspace can be utilized by community members, for internal needs, and during projects for prototyping purposes. Makerspace C – co-working space–, on the other hand, is adopting an unstructured procedure. The people is welcomed if they are neighbors or if they come by referral. Moreover, with CoderDojo events, they opened up the space to children while they were mentoring them. Makerspace D – lean-start-up– used to have an open to public makerspace, operating in membership subscription model; however, the business model couldn't sustain. The founder of the makerspace said that "Especially in 2014, 6 years ago, I witnessed a great amount of interest, but no demand. People were not into it. I imagined a place where people could use fabrication tools and make technological productions on monthly memberships, similar to the gym membership. But I guess the business model was early at that time". Currently, they are focusing on corporate services which are built around maker activities.

4.1.2. Financial Dynamics

There are several ways and practices to sustain a makerspace (Woolls, 2018). According to Kurti and Kurti (2014), different models can be adopted for cost management both for the start and the maintenance. Makerspaces in developing

countries have the tendency to "undertake contract work from governments, private companies, NGOs and foreign donor agencies to gain financial and organizational support, and may work on strictly commercial and confidential projects" (Sanderson, 2015; Saunders & Kingsley, 2016, as cited by Zindy & Heeks, 2017, pg.18). In the study, one of the common methods of funding is gained through contract work and the makerspaces have achieved to diversify their funding channels to sustain their businesses.

This diversity also signifies there is a broad range of standards that makerspaces need apply along with contracting perspectives among makers, the projects, the makerspaces themselves and the network they have established (Zindy & Heeks, 2017). Each of them has adopted multiple methods and channels. However, there are closer similarities in between two makerspace clusters: Makerspace A – educational space – and D – lean start-up –; Makerspace B – embedded facility – and C – co-working space –. Makerspace A – educational space – and D – lean start-up–focus on the educational programs, makerspace built-up and activities while Makerspace B – embedded facility –and C – co-working space –focus on professional services such as experience design and design projects. In terms of channels, Makerspace A – educational space – is specialized in children education and in this respect, they closely work with educational organizations such as schools while Makerspace B – embedded facility – is working closely with private corporations.

4.1.2.1. Activities

Education is one of the most productive activities for makerspaces. Their educational potentials as alternative learning environments is highly appreciated (Otieno, 2017; Hira & Hynes, 2018). Maker education is defined as a new model of education by integrating information technologies, using open innovation and exploration and adopting the creation –based learning, which in return cultivates innovative skills (Xianmin and Jihong (2015). At the same time, maker tools provide flexibility for learning and education as these tools can be adopted to a wide range of disciplines, learning environments, focus and age of the learner.

In the study, there are two approaches to the maker education. One is offering catalogue educational programs in which the maker education contents are curated, and which involves the trainings of the use of equipment. The courses can be divided into three main categories: coding, design and electronics. However, the course subjects can be as diverse as entrepreneurship, gamification along with mind mapping and design thinking methodologies. Open source tools or platforms such as Scratch or Arduino are heavily used during these courses. These courses are even turned into products by makerspaces through which people can buy the educational programs listed in the makerspaces' websites. Moreover, the catalogue courses can be modified according to the need of the stakeholders. The participant from Makerspace D – lean-start-up– explains that "There is a fix catalogue which includes 12-15 courses; but eighty percent of our work is tailored made. Depending on the need of the corporation, we combine our capabilities into a new program. … If we are working with a retailer, we plan to make a smart retail store. If it is a pharmaceutical company, we offer making a sphygmometer."

The other approach focuses on concept-based programs or events. For instance, Makerspace B – embedded facility – organized a 3D printing workshop for solving everyday problems, in which 3D printing technology was aimed to be explored both theoretically and practically. Regardless of the approach, maker education focuses on trainings of tools and learning by doing attitudes. In addition to these, maker educator programs are also offered by the makerspaces. The educator programs are not restricted to the educators only, and similar to the approaches on maker education, the educator programs offered can be catalogue based or concept based. Makerspace C – co-working space–, which supports the concept based programs, organized an educator education workshop on designing toys and materials in participatory classrooms. The aim of the project was to teach the educators the methodology, instead of showing how to do it, as suggested by the participant.

The makerspaces also create content and curriculum agenda in the scope of maker education. The models are shifted and customized according to the scope of the project. The maker participants call it a tailor-made process. Also, they can utilize their skills to reproduce the existing contents of the stakeholders. For instance, for a NGO collaborated project, Makerspace A – educational space – recreated the educational content of that NGO by using the gamification principles while making an interactive touch screen so that students can learn the content by playing, which aimed to increase the involvement of the students. These examples can be multiplied with many.

Events and the organizational activities makerspaces provide are based on workshops and maker faires. Large scale maker faires were organized with the start of the movement in Turkey, first one organized in 2014, successively held in 2015 and in 2017, and they have not been organized since then. Interestingly, the name of "maker faire" was franchised in 2015, therefore the organizations that are held within different maker communities and makerspaces cannot be named as maker faire. For instance, Maker Group B – event-based community– organized a maker faire in Ankara, called Maker Festival as they couldn't use the franchised name. Even though franchising is one of the methods for growing social innovations (Murray et al., 2010), for a movement which leverages open source, franchising the name of maker faire is also a sign of closing the system, which might lead to constrict the diffusion of the movement in Turkey. Maker faires are defined as a festive place for the maker movement to show the creations of makers and to huddle makers from various backgrounds such as "tech enthusiasts, crafters, educators, tinkerers, food artisans, hobbyists, engineers, science clubs, artists, students, and commercial exhibitors" together. (https://makerfaire.com/). It provides makers a meeting point to get to know each other. Also, similar to maker faires, exhibitions are organized as a part of a project, enabling individuals to share what they have accomplished.

Workshops can be in diverse formats such as hackathons, ideathons, camps and theme-based or educational workshops. They have many application areas. Workshops benefit heavily from design-thinking methodology. Problem definition in these workshops can focus on the work area of the stakeholder; for instance, for a pharmaceutical company, the workshop was designed to make a sphygmometer by using IOT by Makerspace D –

lean-start-up. While learning by doing and teaching a subject by involving individuals are leveraged; the subjects are shaped by the work area of the stakeholder.

Themes of these workshops are commonly influenced by Sustainable Development Goals (SDGs), set in 2015 by the United Nations. Sustainable Development Goals are defined as a "blueprint to achieve a better and more sustainable future for all" as a part of the 2030 UN Resolution (https://www.un.org/sustainabledevelopment/sustainable-development-goals/). Actions taken are gaining momentum in this realm as guidance books to align makerspaces with SDGs and studies are being published as well as extensive consortium involving researchers and practitioners on the subject are being organized. One of the participants from Makerspace D – lean-start-up– commented that at the workshops, they hand out SDGs and pyramid of values brochures and try to initiate meaningful innovation.

4.1.2.2. Funding

Public grants, sponsorships and professional services are among the main funding channels for the makerspaces. Especially NGO collaborated projects are funded by public grants. The makerspaces undertake the facilitator role and support the project owner NGO within its capabilities such as providing maker education trainings, educator education programs, workshops or makerfaire organizations and mentorship. As the grant application process requires an area of expertise, NGOs are more skilled in applying to grants than makerspaces. The focus of the project is shaped by the work area of the NGO. For instance, Makerspace A – educational space – has been collaborating with an NGO on marine protection on a multiple-phased project that involves an educator education for teachers, STEM lab built-up and developing projects

with elementary school students with the help of the teacher in order to find solutions for clearing the shores and the seas by using maker tools. The project was funded by the public grant of Istanbul Development Agency.

Public grant programs leverage collaborative projects especially among public and third sectors/ civil society. Private sector can also fund projects as a partner or under a sponsorship. If involved as a partner of the project, they share the responsibilities. They are actively involved with the project to some degree; for instance, they can host the participants at their office, a part of the education program can be sustained from the corporate.

Sponsorships are a broadly accepted practice which involve private companies. The company provides the necessary financial support for the project. Sponsorships are usually carried under Corporate Social Responsibility (CSR). The project beneficiaries can be the employees, employees' children, or people in need, who are usually defined by public institutions or NGOs. Sponsorships are relatively more open to cross-sectoral collaborations as the funding restrictions are more limited compared to the public grant programs. Maker group A – urban hacking community– is heavily focusing on sponsorships, defining it as a dark marketing campaign for the corporations.

Another way of funding is service. Service can be broadly defined as applying the area of expertise and interest of individuals in makerspaces into a service. Makerspaces utilize their capabilities such as maker education and makerspace build-up along with their technical capabilities to provide services and consultancy to the organizations.

Even though all three sectors may need consultancy in these areas, usually consultancy service is provided to private and public sectors. The consultancy service also involves design and design methodologies in addition to the maker activities. The outcomes of these activities can be later prolonged for productization by consultancy services. Makerspace build-up is another service that makerspaces offer. Depending on the constraints of the stakeholder- space, budget or need- makerspaces building can range on a wide scale. Makerspaces have been built in multiple places such as public areas like municipalities, schools, and private companies. Moreover, makerspaces can build STEM/ STEAM (Science, Technology, Engineering, (Art&Design) and Math) labs, which are designed slightly differently from makerspaces as the goal is to teach students in guidance with a curriculum while makerspaces is defined as community spaces where individuals can make things in a brief sense. As stemming from the education discipline, usually schools prefer STEM/STEAM labs. For instance, as mentioned earlier, in the project with the NGO on marine production, Makerspace A – educational space – built a STEM lab in one of the public schools in Istanbul.

Makers use their expertise as a way of transferring the knowledge into a service. They do talks on diverse topics such as digital transformation, innovation, social entrepreneurship, art and technology and of course on maker movement at various platforms from universities to TV shows, from corporations to municipalities. While they usually have multidisciplinary skill sets, they are acting as an advocate for the maker culture and maker movement. Even though some of the talks are based on a volunteer basis, some of them are a source of income for makers.

4.1.3 Capabilities

According to the analysis of Oates (2015, p.17), the literature has agreed upon that "makerspaces allow cross-disciplinary integration of science, technology, engineering, art, and mathematics." Moreover, makerspaces are differentiated from learning environments as they promote “making in disciplines that are traditionally separate” (Sheridan et al., 2014, p. 526). In addition to their capabilities in both traditional and digital fabrication tools, makerspaces also adopt a handful of skills. These skills are usually shaped by the backgrounds and interest areas of individuals in those makerspaces, ranging from robotics to VR, from drones to design thinking, and the related areas of expertise, which can be shaped by the current demand and the trends. For instance, the 21st century capabilities are recently covered extensively by makerspaces; educational programs can be shaped around the 21st century capabilities or workshops can be organized on the subject. Overall, however, they share characteristics to following global trends, adapting quickly, being conscious of the social problem in their surroundings, voluntary mindset, using technology heavily and working around complex problems or within a collaborative environment. Even though these characteristics are not applicable to all, they share the essence of maker culture, and makers share the characteristics of being enthusiasts, playing with technology and enjoying interconnectedness as described by Dale Dougherty (2012).

Technical capabilities are fundamental to the makerspaces and they can be revised under three subjects: design, software and electronic. At its core, they are mastering in prototyping processes both with the skill sets they share and the know-how on the innovation phases. Even though design and electronic can be reviewed under hardware,

these skills are not necessarily used together and design is also leveraged beyond product production, but as a discipline. In other words, design is used to cover a broader context, anything related to the outer part of a product from modeling to production in addition to the discipline itself. One of the commonly used design fabrication tool is 3D printers, along with laser cutting and traditional craft tools. Even though each makerspaces might have different tool sets in accordance with what is being produced at that space; for instance, biohacking requires different equipment than a hackerspace, they all have networks whether by location or through direct contact to reach the necessary production equipment and/or individuals if the object requires a different skill set. For instance, Makerspace A – educational space –, which has a comprehensive maker area, with FabLab membership, intentionally did not buy laser cutting machine as around the neighborhood, it is an easily-found tool.

Electronic is another engineering related capability of makers. With the help of microcontrollers, such as Arduino and Raspberry Pi, electronic prototyping and IOT applications can be made by non-technical individuals easily, which accelerate the process and the learning curve while increasing their extensions. Moreover, software is one of the key capabilities of makers. Coding as well as hacking have been fundamental since the beginning of the maker movement. Nowadays, block-based visual programming tools are also heavily used to teach primarily students how to think in an algorithmic way.

In addition to these technical capabilities, makers are knowledgeable in materials as they experiment extensively with materials to produce and make things. Material

knowledge can shape the way makers interact with materials while being influential on the way makers think and comprehend (Aktaş, B. M. & Mäkelä, M., 2019). Moreover, even though some makers and makerspaces have been criticized for not being environmentally friendly by extensive usage of materials, especially plastic, the relationship with the waste materials are constantly being redefined by the makers. Hacking the everyday materials and objects are adopted by makerspaces. One of the stakeholders from Makerspace C – co-working space– mentioned that during his/her classes, s/he was telling his/her students that their moms are hackers as they are using the yogourt container as a pot. With the help of this method, s/he aims to teach the concept of hacking. Also, s/he was teaching them the different kinds of paper and scissors to help them increasing their material knowledge. With the help of these, s/he was aiming to raise the awareness on the material usage as well as their relationship with the materials.

By nature, interdisciplinary collaborations are inherent to makers whether they are making the actual production or not. Interdisciplinary thinking enables individuals to apply knowledge and skills from multiple areas to find creative and integrated solutions to problems. In other words, it both enhances the comprehension of the current problem and the capacity to develop an authentic solution to it. Design thinking method is a commonly used method, which has contributed to the social innovation field greatly as well (TEPSIE, 2014). This methodology has become popular as global companies such as Google and AirBnb have gained notable success with the help of it. Design thinking is used to tackle problems in an iterative way by following phases of empathy, definition, ideathon, prototyping and testing. This method has been used by

makerspaces' agendas in various ways such as by providing a professional service to companies or by integrating it to their education programs. Agile and lean methodologies have been also utilized by makerspaces. While agile is used for project management, focusing on collaboration with stakeholders and making improvements in each step, lean methodology is more related to effectiveness and efficiency. Makerspace D – lean-start-up– has been also adopting these methodologies for its organization. Overall, these methodologies are utilized as an area of consultancy for the makerspaces, as well.

4.2. Diffusion Models of Makerspaces

This section is closely related with the sustaining dynamics of the makerspaces and it aims to shed light to the relation between the stakeholders and organizational and financial dynamics. Moreover, it examines how the makerspaces use communication for establishing the diffusion. However, before going into details with the current situation, it is crucial to remember the start of the maker movement in Turkey and how these organizations were formed. The maker community first evolved around a closed meeting when Dale Dourthey - considered by some the father of maker movement and CEO of Maker Media, visited Turkey in 2014. Shortly after, the first makerfaire was organized in 2014 and community meetups started to be organized. Individuals and companies that have been working in relation to the maker movement such as 3D printer company, Robotics teachers, interaction designers, and so on, even though they didn't call themselves makers at that moment, they started to have a common ground to meet and collaborate. The four makerspaces, examined for the study, evolved in one way or another around these activities. They organize different activities by using

digital channels, usually shaped with voluntary work, the diffusion includes involving and reaching others through networks.

4.2.1. Communication Channels

With the media coverage of makerfaires, the interest in the topic enabled the maker movement and makers to reach to wider audiences; invitations to talks all around the country had been sent to makers. The participant from Makerspace A – educational space – mentioned that "We have become visible as leaders of the maker movement with maker faires and the events we have been participating at. We give interviews on the maker movement for newspaper, magazines and television. We organize events in here and invite people from our network. People bring people. It has grown fast in an organic way. Maker meetups are organized and we participate at those. The network has spread swiftly".

In the early days of the maker movement, while it was shaped around volunteering, content translations from English sources and content creations, attending meetings as a speaker, and teaching tools were one of the ways to communicate the maker movement. Today, the makerspaces communicate through online communication tools, especially by heavily using social media, their websites, and/ or personal or corporate networks they have established. Interestingly, the communication message they convey has been recently shifting from the maker movement to the current trending topics such as the 21st century capabilities. The same interviewee said that "Right now, digital transformation, artificial intelligence and entrepreneurship are trendy subjects. We have organic bonds with these notions as I think they are all stemming from experiential

learning. Therefore, I cannot say that we are trendy right now, but we are not irrelevant either. And we distinguish ourselves with experiential learning, 21st century capabilities, and entrepreneurship. We think it is not important what you call it, but what is important is what you do and what the content is."

4.2.2. Stakeholders

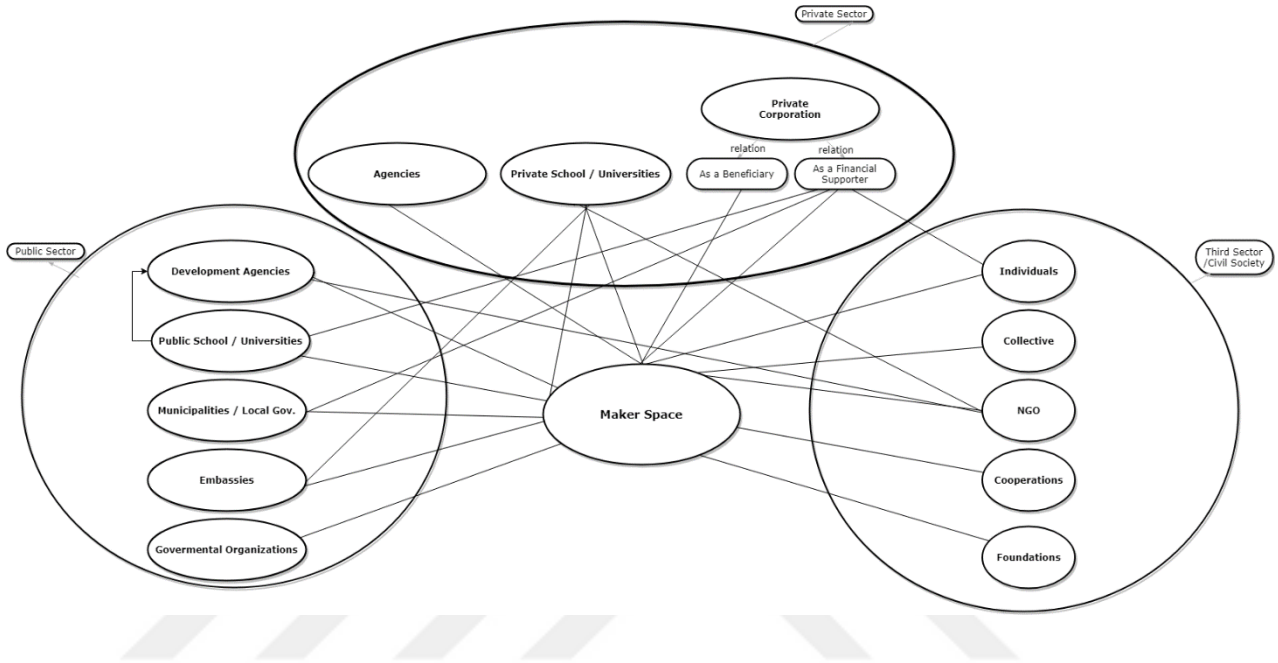
Stakeholders are essential for the makerspaces both for the diffusion and the sustainability. While it is possible to increase the variety of stakeholders, it will be examined under three sub-categories: public, private and third sectors/ civil society. The relationships of the makerspaces with each of these sectors have different characteristics. While the relationship with the public sector is usually indirect or not a close one, the makerspaces, depending on their focus, have been closely working with some of the actors in the other sectors. For instance, while Makerspace C – co-working space– has been working with organization agencies, advertisement agencies and architecture or design offices for experience design projects at the same time, they are taking part in the projects of NGOs, foundations, collective or cooperatives. Makerspace B – embedded facility – has been working with a broad array of stakeholders with a focus on private sector, as well. While Makerspace D – lean-start-up– is mostly working with private corporations, they are also collaborating with municipalities or schools, or while Makerspace A – educational space – is providing services to schools, especially private ones, they aim to be a part of collaboration projects with NGOs. The participant from the same makerspace suggests that “One of the biggest problems we notice in Turkey is the lack of collaboration culture. We see it as a problem and we take an action on it. And in a sense, sharing is a part of the maker

culture. (…) Most of the resources are open source. Open source means sharing and sharing culture, and we face with problems that we cannot solve if we do not work together". These relationships can be built upon short-term or long-term projects. Moreover, in addition to the collaborations made with the actors from diverse sectors, the makerspaces are also involved with the projects that consist cross-sectoral collaborations. In these cross-sectoral projects, the makerspaces are usually positioned as facilitators and capacity builders. The dynamics of these collaborations involve a project owner, a financial partner which is a public organization such as development agencies or public grants or a private corporation and a beneficiary partner which is usually an actor from third sector/ civil society or a public institution such as a public school. The cross-sectoral collaboration projects have a longer preparation period as well as a longer project duration, which makes the scope more holistic. Even though the makerspaces are not positioned as the project owners, they are involved with the project ideation and project development process. When examined from the perspective of the social innovation process briefly, the involvement of the makerspaces focuses on the stages of Proposals and Ideas (2.2.1.2.) and Prototyping and Pilots (2.2.1.3.). The success of the projects are measured with informal methods such as receiving feedbacks from the participants, which will be examined in detail in the section 5.1.2. The makespaces are not usually involved with the following social innovation stages while they lack the mechanisms to follow up the outcome of the projects that have been developed during maker activities.

Moreover, stakeholders are closely related with financial dynamics as the relationships among the stakeholders are shaped by financial dynamics while the relationships with

the non-profits are also a part of the stakeholders. In the chart below, it showcases what kind of relational network that the makerspaces have built with the stakeholders.

Figure 2. Relationships with Stakeholders



4.2.2.1. Public Sector:

Public sector can be as broad as municipalities or local governments, development agencies, schools and governmental organizations. Even though it is possible to adapt all the financial models to the public sector, collaborations are mostly established through funding programs, which is generally organized by another stakeholder such as a NGO or a foundation, which adopt maker activities to the projects they are carrying out.

Maker Group A– urban hacking community–, which is on the verge of being institutionalized, has a closer relationship especially with local governments as they

focus on the public sphere and urban hacking projects. Even though the funding is limited for the urban projects, local governments play a role by opening their sources and helping the maker community to get necessary permissions for the projects.

Makerspace A – educational space –, focusing on maker education, has built relationships with the public sector in a wide range, such as Provincial Directorates of National Education, Ministries, research councils, development agencies. However, the relationships can be unpredictable, closely related with the current political situation as the co-founder of that makerspace claimed, referring to the public sector that "After July 15, a coup attempt, they all were cut down abruptly." Overall, the relationship with the public sector is not continuous and even intentionally it is not privileged by makers either, because of the long bureaucratic processes.

4.2.2.2. Private Sector:

The financial relationship is more fluid with the private sector compared to the public and third sectors as financial resources might be limited or under strict control. The makerspaces provide a wide range of capabilities for private companies to leverage for their specialized teams and departments. The founder of Makerspace D – lean-start-up– which applies lean methodology to its organization mentioned that "we go to companies and tell our story. Then the HR says that I can give this to my employees, the employer brand manager thinks that we can arrange a hackathon for 21st century skills. Corporate communication department thinks of organizing a hackathon on sustainability. IT thinks that they can build a robot. So, everyone finds something according to their needs." As the subjects the makerspaces relate to are broad and

fertile, they provide a modifiable content in which the elements of the sector of the company as well as the area of expertise inside the company can shape the project in question.

The relationship with agencies are shaped with private companies as well, as the projects, whether initiated by the agency or the company or co-created with the agency and the company, can be considered under professional service offered to private companies. Agencies can be classified as organization agencies, advertising agencies and architecture-design offices. Tailor-made software and hardware productions are essentials; and experience design and interaction design play the bigger role. These projects usually focus on installations at a designated area to increase the interaction of the targeted audience of the brands, which can be categorized under a communication strategy.

Private schools have been highly interested in the maker movement. While public schools can be the beneficiary of the projects that are funded by the public or private sector actors, private schools are building makerspaces at their schools, giving maker education to their students or educator education to the teachers and organizing maker faires. Teaching maker education can range from primary schools to universities, also the subjects that are taught are diversified. However, the interest from schools is also seen as not genuine by makers as some of the participants claim that the makerspace areas, built at the schools are not used effectively, instead they are utilized just as an appealing asset for the schools.

Sponsorships are considered as a good financial source. However, the dynamic is slightly changed as the involvement of the company is limited while in partnership relationships, the actors share the ownership. Companies gain promotional advantages with sponsorships; however, with the partnerships, both the responsibilities and the outcomes of the projects are shared by the stakeholders. Also, partnerships have a greater potential to build a longer relationship, which define the sustainability factor. However, they face certain barriers which will be discussed in more detail in the sections of Problems (5.2.).

4.2.2.3. Third Sector/ Civil Society

Third sector/ civil society plays a significant role as it lies in the conjunction of government, market and community (Avelino et al., 2019) while it helps identifying and articulating social needs, suggesting ways of addressing them, staging competing claims for the good society and encouraging various forms of engagement – such as volunteering and association (TEPSIE, 2014).

The relationships with NGOs, foundations, collectives and cooperatives are usually established on voluntary bases or based on funds raised by private or public sectors. Individual motivations of the makers also play an important role in social projects; the foundation of the maker movement is also essentially related with the volunteerism by the makers. Many have built organic bonds with the actors from the third sector/ civil society. In addition to that, social organizations can be in the role of project owner; in this case, funding is sustained through public grant programs or with private corporations. The projects focus on the problem areas that the social organization

focuses; in other words, the subject is shaped by the work area of that organization and the problems they tackle becomes the subject of the project. For instance, while working with an NGO on marine protection, the subject of the activities and the projects are focusing on water footprint, marine production or climate crisis or while working with an art foundation with a museum, the subject of the project is focusing on art making with technology, aiming to create an experiential space for children to learn and think by doing. Moreover, organizations in the third sector/ civil society can be the beneficiary of the projects as well or they can help to reach the beneficiaries through their networks. The makerspaces usually adopt the facilitator role in these projects in the role of educator or activity facilitators while content creation, workshops and educator education are main collaboration areas.

Similar to the relationship built with the private sector, building long-lasting relationships enable makerspaces to create more long-term and in-depth projects in which the outcome of the project is better defined. Trust, established through the relationships, plays a more important factor this time. As mentioned earlier, socially innovative projects with or without the involvement of an organization, can be originated from individual motivations of makers as well. Individuals at makerspaces have high awareness of the current issues and problems while collaboration and sharing have become inherent with the help of open source culture of the maker movement. For instance, Makerspace C – co-working space– initiated a social responsibility project of CoderDojo with the aim of mentoring students who were interested in coding. Different from a maker education program with a curriculum, it aims to teach them by doing together and helping students through their coding journey.

Another example to the maker initiatives is RobotEl Association, which started as a social responsibility project, inspired by the Enable the Future Movement; it is now operating as a NGO, helping children with Amniotic Band Syndrome by making customized 3D printed mechanical hands or arms.

To sum up this chapter, the makerspaces have adopted different and unique organizational models and strategies while accomplishing to diversify their financial dynamics, which has enabled them to sustain their organizations. The variety of the skill sets and the services they have developed has led them to build a wide range of stakeholder network. In terms of how the makerspaces contribute to the practices of social innovation, there are two outstanding ways. Firstly, they initiate their own socially innovative projects. These projects are usually voluntary based social responsibility projects. Therefore, it usually raises the main problems on sustainability, growth and diffusion as the resources for these projects stay limited and they are based on volunteering. Only one of the projects has become institutionalized, operating as a NGO, which provides the mechanisms to sustain it. The NGO has built a voluntary network around Turkey to make 3D printed personalized mechanical hands or arms for children with ABS syndrome. In addition to that, it helps building teams in private corporations, and it is applying for public grants for improving the skills of the voluntaries and expanding its network while with the help of those activities, it sustains itself financially. Secondly, the makerspaces are involved with the socially innovative projects through the stakeholders. The scope of these projects can diversify. By and large, while the third sector& civil society generally plays a leading role for the socially innovative projects, the private sector or the public sector usually take part as funders.

The role of the makerspaces are usually focusing on facilitating maker education and maker activities. In addittion to the fact that, overall these projects are focusing on some of the social problems more than the other. Even though it is difficult to make a critical assessment on it as there is no comprehensive and accurate database on makerspaces (Dickerson (2015), the study shows that the problems that the makerspaces are focused are plastic waste, water pollution, refugee inclusion and empowerment, urban problems thorough civic engagement.

CHAPTER 5. CROSS-CASE ANALYSIS & DISCUSSION

This stage of analysis consists of an evaluation of cross-case analysis of the makerspaces. The chapter will focus on whether the makerspaces contribute to social innovation and its process. As mentioned earlier, there are mechanisms and process for social innovations to emerge, which is closely shaped by various dynamics. The previous chapter aims to discover the dynamics of the makerspace context in Turkey. The analysis has revealed the background and contextual information while shedding light on the fact that the makerspaces in Turkey can overcome some of the social innovation process easily while facing problems in others. For this matter, firstly, problems will be examined in the course of social innovation process; and later, potentials will be discussed along with the solutions that they find for the problems they face.

Makerspaces are described in a nutshell as "holistic places of learning offer an excellent space to conceive, design, implement, and build prototypes that are project-based, interdisciplinary, and solve real world problems" (Lensing, et al., (2018), as cited by Taheri et al., 2020). This description of makerspaces show the intersectional areas with the social innovation process as well, at least according to the hypothesis of this thesis. While the Defining the Makerspaces (4.1.) and Diffusion Models of Makerspaces (4.2) sections have been investigated to gain a deeper understanding how the makerspaces function and what kind of relationships they are building with external organizations in Turkey, the cross-case analysis of the makerspaces will be evaluated in detail from the perspective of social innovation and social innovation process in this chapter. Even though each makerspace has developed unique models, they share similar potentials for

social innovation process while encountering some problems. In this section, the maker groups are included into the evaluation due to their potentials for their community building potentials while whether or not the group is being sustained and how the sustainability of the groups is established serve valuable insights.

Before going into detail in examining the problems and the potentials of the makerspaces in social innovation process, the perception of makers on social innovation can be resourceful to better understand the relationship. Social innovation is reflexively used with social responsibility and social entrepreneurship. According to Huybrechts and Nicholls (2012), there is an overlapping area between social innovation and social entrepreneurship; however "a difference lies in the fact that social innovation is not necessarily market oriented, while social entrepreneurship clearly is" (as cited by TEPSIE, 2014, p. 32). Voluntary participation and work have been essential to the maker movement especially at the start. Even though they are for-profit organizations, the makerspaces have been still carrying out social responsibility projects. Moreover, the participants from the makerspaces have generally a high social awareness to social problems around them.

Social innovation is related with the concepts of looking for meaning; redesigning with the help of existing technologies; socially impactful new movements; environmental and human orientedness such as topics that SDGs focus. One interviewee from Makerspace B – embedded facility – defines social innovation as "making improvements by approaching an existing issue which concerns a part or all of the society", which can be considered as the closest definition to the descriptions in the

literature even though all of them are relevant as well. Overall, as the consensus on social innovation description is not reached by the academics, the participants also describe the social innovation differently from each other, revealing that there is no common ground. Moreover, in line with the Social Ecosystem in Turkey by SIX (2018), it reveals that there is a lack of common description of social innovation among the makerspaces, which is; however, an essential part for increasing the dialogue.

During the interview, the participants were asked about the relationship between the social innovation and the maker movement. One participant from Makerspace C – co-working space– comments on the question as "as the maker movement is supporting local problem solution skills so as the social innovation, there is a relationship in between; because the social innovation occurs outside of industrial solutions." Makerspace A – educational space – interviewee mentions that “I see the traces of the maker movement in the social innovation culture. I notice that the maker movement or the people from the movement, the projects that have stemmed from the movement or the students, the educators and/or the people who come across with the movement one way or another develop more projects with a focus on social impact. Because I think it breaks the inertia; it lowers the barriers and breaks the cycles for making mistakes, learning by doing and trying again and again, making iterations, changing and constantly evolving. Therefore, I believe it has a tremendous contribution; I am not suggesting it is the only source, but it contributes to it.” In addition to the intersections between the maker movement and the social innovation, one participant from Makerspace D – lean-start-up– points to the financial problems by

adding that "Makerspaces are knowledgeable in machine and technology knowledge, which is not sufficient enough. Speaking English to analyze data sources and having awareness are also important. Even though these two are okay too, there is no money. If we decide to work on smart cities or find solutions for pollution in Turkey and want to solve these problem together, we do not even have enough money even to buy a kit for a hundred people."

5.1. Problems

There are certain problems that the makerspaces face for contributing to the social innovation process. In this section, according to the cross-case analysis, factors of sustainability and lack of evaluation methods emerge as outstanding problems. Even though these problems are explained separately, they are interrelated and connected to the makerspace context as a whole. From the perspective of social innovation, sustainability is closely related with securing the financial resources; however, “relational capital” also plays an important role, which is a concept for capturing “the quality of relationships within which economic exchanges take place” as suggested by Murray and his collegues (2010, p. 74). The makerspaces in the research have achieved to survive financially and sustain their organizations. However, when the relationships with the stakeholders are considered, along with the socially innovative activities they are engaged with, the sustainability is not always the main concern, which brings potential problems for the makerpsaces to be a site for social innovation.

Another problem that the makerspaces face is the lack of evaluation methods. Using metrics for evaluation is a tricky area for the social innovation as the answers to the social phenomenon are not usually straightforward. There has been improvements in the evaluation and the metrics with the help of the growing interest in the field; moreover, it plays an important role to bring the potentials forward. However, the makerspaces are not adopting systemic evaluation methods for their projects, but only using informal feedbacks from the participants. At best, the stakeholders that they are collaborating with are conducting the social impact assessment of the projects. However, as in the sustainability section (5.1.1.), the makerspaces are not generally informed with the evaluation, which might result in preventing the potentials of the makerspaces in their contribution to the social innovation process.

5.1.1. Sustainability

Sustainability involves two dimensions for the makerspaces. One is about the sustainability of the relationships with the stakeholders and the other is about the sustainability of the outcomes of the projects. The projects are the outcome of the relationships with stakeholders and they leverage the capabilities of the makers and the makerspaces such as organizing an ideathon on SDGs or creating a maker education syllabus and implementing it to a school. These projects can be examined under short-term or long-term. Short-term projects are activity based and the knowledge sharing is very limited so as the relationship that is built. While they are beneficial to ignite a curiosity and raise awareness in individuals in large quantities, they, at the same time, bear the potential for leading to the long-term partnerships with the stakeholders. Sustainability of the relationships with the stakeholders is crucial to build the trust

while improving the quality and the scope of the socially innovative projects that are being developed in collaborations. According to the report of *Social Innovation Ecosystem in Turkey* by SIX (2018), “trust as a core principle is at the heart of building individual and social empowerment and it is acknowledged as a critical factor to especially scale social innovation models” while it is stated that it is a lacking factor and it raises as a challenge in Turkey. Similar to the social innovation ecosystem actors, it is a problem that the makerspaces face as well. Moreover, long-term projects which enable in-depth knowledge sharing are usually established in accordance with the relationship that has been built with the stakeholder(s) resulting from the personal and/or organizational networks or their previous collaborations. The participant from Maker Group A – urban hacking community– states on that as "it depends on how you convince the corporation. You have to make them believe that you can handle it,” as it has taken two years to work on a more comprehensive project with a global private motor company. The educational project that they are currently working with the company was developed as a result of the previous short-term activities they did together for two years. The project involves high-school students who build their teams to solve a problem from their surroundings; these teams if accepted to the program are going through an online education phase, lasting six weeks, created by the maker community, during which the makers provide them an online mentorship. The jury chooses eight schools where the mobile makerspaces visit. While the students have a change to make their prototypes at the mobile makerspaces, they also have a change to learn the production tools and to gain the material knowledge with hands-on experience. At the end, one project is chosen to be sent to the global R&D center of that company in Italy.

The ideas and/or the prototypes that are developed as the outcome of the projects are generally designed to be demonstrated as a presentation or at an exhibition. How these ideas and/or prototypes that are created at the projects will be sustained are not usually defined in the scope of the project except by the few. Even these ideas and/or prototypes are actualized by the stakeholders, the makerspaces are not usually either informed by them or not involved with the process. One interviewee from Makerspace D – lean-start-up– has mentioned that the project ideas that are created during their workshops are actualized by the private corporations if there isn't a feasibility problem while adding that they do not acquire this type of information from them as the information is kept confidential. For that matter, the lead of the makerspace of Makerspace B – embedded facility –, which is positioned as an embedded facilitation, criticizes this phenomenon as "the maker movement focuses on making, not questioning the rest. With open source, people have gained the habit of making; however, it is not questioned what is going to happen to the things that are made in those spaces. Usually the things that are made as maker activities stay as the way they are". For that matter, at the organization that the Makerspace B – embedded facility – belongs to, the projects are aimed to be designed with this perspective of sustainability in mind. There are exceptions as well. For instance, Makerspace A – educational space – has worked with the German Development Agency on a capacity building project for Syrian refugees. During the project, refugees have had a chance to learn different skill sets such as problem solving and prototyping along with entrepreneurial skills. As a result of the project, three projects that are created by the participants (e.g. an app for refuges to assist them in the health care centers) are funded by the Agency, which is essential for an idea to step into the sustaining stage. However, it is usually related with

the perspective and the financial sources of the project owner and the makerpaces are not generally involved or concerned with the sustainability of the projects.

Even though the makerspaces may initiate socially innovative projects, usually named under social responsibility, in collaboration projects, they generally take the facilitator role in maker activities. They are skillful to lead the participants during project creation as makerspaces' knowledge is extensive in production processes, production tools and material usage along with creative problem solving. Determining the framework of the project and designing it in collaboration with the stakeholders can shape the role of the makerspaces in those projects while helping to build more sustainable relationships.

5.1.2. Evaluation

Evaluation is gaining importance particularly at the scaling and diffusion stage of the social innovation process as explained in detail in the section 2.2.1.5.. Murray et al. (2010) brings forward that there are three tasks performed through metrics for the evaluation: "to provide funders or investors with data on impact; and to provide a tool for organisations to manage their own choices internally; to better understand long-term processes of social change and impact" (p. 101-102). These tasks are not distinct from each other and one metric cannot be used for all.

The makerspaces are not utilizing these metrics or any evaluation methods both for the organization or the socially innovative projects that they have been involved with. The projects are also not usually documented systematically. Moreover, what is documented if applicable is focused on the actualized reports, consisting of the number of

participants and their testimonials. The documentation of the projects are also very limited while the makerspaces are not usually informed by the results or do not have an access to the reports that are created by the stakeholders. Even though they have not adopted a framework for measuring the impact of the projects, there are informal ways for makers to measure the outcome of the projects. One of the most commonly used methods is receiving feedbacks both from the participants and the stakeholders. Even though they are not documented either, these feedbacks are used for their improvements. Another informal evaluation method for success is the sustainability of the established collaboration; it can be in the form of providing a different form of service or doing long-term projects. One interesting method for evaluating the outcome of the projects is suggested by one of the participants from Makerspace C – co-working space–: to be copied by public, private or third sectors / civil society. S/he mentioned that "We look for how we are being copied by others. It is a good evaluation method in Turkey. We pay attention to how public organizations, NGOs and private companies copy us. Because, for instance, we have created a document at a meeting, and I realize that a teacher from Van (an Eastern city in Turkey) uses our document just as many other teachers, which makes me think that what we have done something that has worked. Then, I notice that a NGO uses the same document when applying for a fund."

5.2. Potentials

This section examines the potential areas of contribution that the makerspaces provide to the social innovation process. While community, collaboration and capacity building potentials of the makerspaces are standing out as contributing elements, when the

stages of the social innovation process are considered, the capabilities and activities of the makerspaces are focusing on the social innovation stages of proposals and ideas (2.2.1.2.) and prototyping and pilots (2.2.1.3.). As emphasized earlier, each stage is not occurring in linear order while they are interrelated and interconnected. However, the prototyping capacities of the makerspaces are incremental. While the wide range of fabrication tools and technologies, utilized by the makerspaces, are allowing for rapid prototyping, the low cost of the equipment and materials make it accessible to a greater audience. Kohtala (2016) claims that "The technologies are not new, as they have been used in industry, particularly in rapid prototyping, for decades; what is new is that costs of the equipment are rapidly decreasing, the machines are increasingly smaller and 'desktop', and the user base as well as use applications are expanding" (p.15). All of these blur the lines between production and consumption, which is one of the key elements of emerging "social economy" in the social innovation as well as the prototyping and iterations (Murray et al., 2010).

The makerspaces, described as a site for tinkering and construction (Kurti et al, 2014) are promoting creativity extensively, and the creativity is an essential part of the social innovation as Murray et al. (2010) suggests that the creative blending and recombination of separate things and ideas along with gathering methods together develop pave the way for the innovation. Moreover, the creativity and/ or design methods are heavily consulted during the idea generation of the proposals and ideas stage (ibid), which are utilized by the makerspaces at the study to a great extent as well. Therefore, the makerspaces and the social innovation process overlap in the idea generation stage through the methods that are acquired. In relation to that, Niaros and

his collegues (2017) are putting forward that makerspaces, leveraging creativity and community-building along with learning, could be disruptive for social innovation.

In addition to the areas where the makerspaces provide contributions in the stages of the social innovation, the makerspaces offer potentials for social innovation in terms of community, collaboration and capacity building. Communities are important for social innovation as they reveal the unmet needs along with "the untapped assets and capacities within communities which may be harnessed to shape solutions, engage citizens and communities and command professional knowledge about interventions" (TEPSIE, p.16). While the makerspaces are promoting collaboration (Vuorikari, et al.,2009; Litts, 2015), they are also collaborating with a wide range of actors from diverse sectors, mostly shaped by their financial dynamics (4.1.2.) and diffusion models (4.2.2). While collaborations are inherent to the social innovation as it involves various actors, collaborations, particularly cross-sector ones, are highly emphasized for the success of the social innovations (Minks, 2011). In addition to that, the makerspaces have been employed as capacity builders across broad subjects by different actors. Moreover, while the social innovation agenda requires "the capacity to imagine new ways of being, new relationships and new ways of doing" (Hexaltine et al., 2016, p. 16) from the actors, the makerspaces have the capacity for divergent thinking and innovation as well as creativity, that can be utilized for the purpose of social development.

5.2.1. Community

Community is a broadly covered concept in the makerspace literature as well as the social innovation literature. Community will be examined under the maker community which involves the communities established around the makerspaces and the individual makers, and communities that the makerspaces have been involved with. According to the data from the interviews, a community based workshop space where people use tools for a small fee – a common description of makerspaces (Holm, 201) – turned out to be unsuccessful in the context of Turkey. Instead, the makerspaces have adopted unique organizational strategies to survive, which has shaped the relationships of the makerspaces with the communities. In contrast to the open community and the community-run makerspace concepts that are highly emphasized in the makerspace literature, understanding the communities the makerspaces interact with along with the maker community is to be discussed in this section.

The maker community with the start of the maker movement in Turkey has been organizing events and they have been regularly meeting at meetups. However, the relationship within the community currently seems to weaken as the meetups and a large scale of maker faires are not organized any more. One participant from Makerspace C – co-working space– evaluates the situation as "From the first maker meeting, I have thought that this concept of ‘maker’ will be consumed in 3-4 years in Turkey. Therefore, we thought that we should try to build relationships as solid as possible within this time. I have met lots of good people and I feel content from it. I don't consider the maker movement as an incredibly successful initiative. However, trends arise from time to time and it is foolish to be defensive against them. Instead, by

manipulating this trend; for instance in this case, bringing people who are making genuinely together – so if we can, let's establish that. We have used tactics like that. It worked at that time. There are 100-150 people who met from that time and they are still friends. It is a power if 100-150 people in Turkey know each other. It is valuable. Still, in times of emergency, we contact with each other and we work together". Overall, the maker community in general and the communities established around those makerspaces with the start of the movement are not as active as it used to be while it has enabled a network for the makerspaces. Makerspace B – embedded facility – differs from that as the community curation is a part of its organizational model, aiming to create a learning environment for professional and social needs of the community members.

Even though the study focuses on the makerspaces, the maker groups are included in the study due to their community building capabilities. Maker Group A – urban hacking community– has built its community on fixing, making and sharing culture with creative urban projects. For their projects, they reach voluntary participants thorough open calls on their social media accounts, and as they focus on urban hacking and public inventions, they are closely working with local governments and neighborhoods. Also, private corporations are sponsoring their events and activities or they work with them in partnership projects. With their street hacking projects, community of Maker Group A – urban hacking community– is also an example of civic engagement as they focus on raising awareness in civic participation in the neighborhood. Even though Maker Group B – event-based community– is currently on hold, the participant

emphasized during the interview that s/he was interested in the community building part of the maker movement instead of the production part.

In addition to the fact that, the communities that the makerspaces are in contact with is a broader area. From the perspective of social innovation, the communities are crucial for their potential to identify the needs and the possible solutions especially at the stage of prompts, inspirations and diagnoses (2.2.1.1.). Some of the communities that the makerspaces are mostly interacting with are minority communities, students and teachers, employees and corporations, maker groups across the world, actors from the third sector / civil society such as NGOs and cooperatives.

For social innovations, the third sector / civil society plays a crucial role in terms of identifying and defining the unmet social needs while proposing alternative solutions (TEPSIE, 2014). They can be the beneficiary or they can provide means to reach the beneficiary groups such as minority communities. In collaboration with the makerspaces, these communities are increasing their capacity to act whether the problems they face are directly related with them as a community or they are focusing on general social or environmental problems. Due to the lack of financial resources, the relationship with the communities in the third sector / civil society are usually voluntary-based or built upon cross-sector partnerships in which one partner is a funder, one partner is a beneficiary and/ or the project owner and the makerspaces act as a facilitator.

In terms of the communities of employees and corporations, in addition to the business problems, social problems are leveraged in maker activities. SDGs are referenced as a guide for social problems while the facilitation gains importance for that matter. One participant from Makerspace D – lean-start-up– mentions that "We are trying to make the participants think about meaningful innovation; in other words, you are creating an idea, but what does it offer to the public, not just to your company? Employees have an instinct for volunteering in fact; they want to something for the nature, they don't just want to be a white collar employee. In short, everybody has the spirit of social innovation and social entrepreneur. (...) One third of the projects created at workshops is focusing on social problems. (...) And generally projects on social problems, if it is doable and it is not highly unfeasible, are put into practice."

With the help of ICT (Information and Communication Technology) and open source, the makerspaces have been following up what has been done in other maker communities across the world. Two of the socially innovative projects - CoderDojo and EnabletheFuture - are originated outside of Turkey, both of which become global and the makerspaces have applied these projects in the context of Turkey. These examples indicate how maker communities are connected through ICT and also how the use of ICT as a tool are effective for scaling and widespread dissemination (TEPSIE, 2014).

5.2.2. Collaboration

Makerspaces have been known for their promotion of knowledge sharing and collaboration with creative use of tools and technology (Vuorikari, et al., 2019). While the makerspaces are promoting participant collaboration during maker activities and

maker education, the makerspaces have been establishing collaborations with other organizations. As discussed in the stakeholder section earlier (4.2.2.), the makerspaces are involved with cross-sector projects or they are partnering with actors from various sectors. Murray et al. (2010) argues that collaborations can establish growth as they are utilized for developing and identifying novel solutions to problems "through increased effectiveness, expertise, knowledge transfer, and learning" (p.99). While collaborations enable the makerspaces to reach wider audiences and to scale up as in the social innovation stage of scaling and diffusion (2.2.1.5), they are also mutually enhancing for the collaborated partner.

In relation with the collaborations that the makerspaces establish, the makerspaces are acting similar to intermediary organizations by connecting people, ideas and resources especially “by providing a ‘safe’ space for collaboration and experimentation” (Murrary, et al., 2010, p. 124). In the final report of TEPSIE project (2014), it is mentioned that intermediaries are considered to play a crucial role in spreading innovations by providing a necessary support for adaptation. Moreover, the characteristics of these organizations are defined as changing roles over time and trade-offs between control and speed. The former means that at the beginning, these organizations provide tools and resources such as training or consultancy which lowers the barrier for adaptation; later its role is shifted for building connections and networking. The latter suggests the dynamics between control and quality compared to speed and extent of the spread. The makerspaces and the makers are equipped with multidisciplinary knowledge, and a wide range of fabrications tools which can provide the necessary support. Also with the maker movement, the spread of the online tools for collaboration and networks has accelerated, enabling the innovation to diffuse easily

and at high speed. However, the makerspaces in the study, except for the Makerspace B – embedded facility –, have lack the mechanisms for structured networks for taking the full responsibility of an intermediary organization and they are not designed as one either. This might result from two factors: the scope of the makerspaces is focused on the practicality rather than the theoretical realm of the projects and/or the ownership of the projects does not belong to the makerspaces, but the partners mostly due to the financial concerns.

5.2.3. Capacity building

Capacity building potentials are closely related with the capabilities of the makerspaces (4.1.3). While increasing the capabilities of the communities, the makerspaces are taking part in capacity building activities which are enhancing the capacity of these communities to act.

Makers are skillful in software and hardware production while interested in a wide range of areas from entrepreneurship to education. Through maker education and activities, the participants learn to acquire new skills across broad subjects and learn how to utilize the production tools by learning by doing, which is helping to increase the technology literacy. At the same time, as maker activities promote collaboration and creativity along with working in an interdisciplinary way, leading to divergent thinking, it increases the capacity to find solutions to the complex issues, which is fundamental for social innovation (Davies, 2013).

Technical capabilities such as coding or 3D modelling and an easy access to fabrication tools are enabling an atmosphere for quick prototyping. The idea behind quick prototyping relies on increasing the learning with faster implementation; which is enhanced to service design and social field (Murray et al., 2010). Moreover, Makerspace A – educational space – has also adopted this strategy of quick prototyping at the beginning as well. The interviewee mentions that "We wanted to build a makerspace like New Lab in the USA. We visited development agencies, but after couple times, we realized that there was a need for a great amount of funding. We did not have an access to it or it would take a long time to access to that amount of money. The idea behind maker movement is think big, start small and grow fast. We thought why we wouldn't start with what we had at that time. We started organizing small workshops at our office in Besiktas at that time. We announced it through digital and social media just to understand if there would be a demand. Soon after, we couldn't fit into the room; then we rented classrooms and later rented one floor in the apartment building. Then we thought about opening up a makerspace. There weren't any makerspaces in Turkey at that time." As prototyping is inherent to the maker culture and maker activities, this quotation also exemplies the mindset shift as the prototyping process of iterating, receiving feedbacks, improving are applied to a situation that is extremely different than prototyping a product. This change of perspective is crucial for social innovation as it builds the capacity for communities to act and find solutions to the problems that they face.

CHAPTER 6 CONCLUSION

Studies on social innovation is gaining momentum as the problems of the world becomes more wicked and complex. Makerspaces have the potential for contributing to social innovation process. Makerspaces have spread widely across the world conjointly with the maker movement. As social movements are crucial from the perspective of social innovation to establish systemic change by mobilizing a wide range of actors across sectors, understanding the development of the maker movement plays an important role. Open source, sharing, working in collaboration, creative thinking and learning by doing are some of the mostly emphasized aspects of the maker movement. What makes it a socially innovative movement is to change the relationship between consumption and production by blurring the lines in between, which plays a part in social innovation process. Makerspaces and the maker movement have spread conjointly in a mutually enhancing way. As makerspaces are providing the movement spaces and means for establishing a base for (socially) innovative activities, the makerspaces are selected for empirical inquiry to study social innovation while analyzing the potential contributions of the makerspaces in the social innovation process. The extensive literature review lay the background for the theoretical framework to analyze the data and the discussion.

Describing the makerspaces in the context of Turkey was the first step. As the mechanisms for social innovation is context dependent and each sector and organizations require different and unique mechanisms, understanding how the organizational models and the diffusion models of the makerspaces function plays a crucial role for the discussion. While the community building capacities of the

makerspaces are highly emphasized in the literature by focusing on the community-run makerspaces and the open community culture, the organizational dynamics of the makerspaces are observed to be different. While the open to public makerspace, based on monthly subscription model, turned out to be not working in the context of Turkey, the makerspaces have developed different mechanisms and financial dynamics to sustain their organizations. Even though all of these mechanisms and financial dynamics are unique to the each makerspace in the study, resulting in the focused areas of work, they are all collaborating with a broad range of stakeholders, shaped closely by the financial dynamics while diversifying their funding channels. While this diversity of funding channels are crucial for sustaining, the variety of the stakeholders are enabling the scale and the diffusion of the makerspaces. In addition to that, when the socially innovative projects that the makerspaces are involved with through the stakeholders are concerned, the makerspaces are skillful to contribute for the social innovation stages of proposals and ideas (2.2.1.2.) and prototyping and pilots (2.2.1.3.) as their capabilities and activities are providing the necessary means. However, there are certain problems that the makerspaces face in their contribution to the social innovation process: sustainability and lack of evaluation. While the sustainability mindset might increase the sustainability of the relation capital that the makerspaces have built over the years, it also plays an important role to consider the scope of the socially innovative projects from the sustainability perspective, determining the framework and the potential next steps of the outcomes. Moreover, the lack of systematic evaluation methods might be bringing potential setbacks for the makerspaces to scale and diffuse further. On the other hand, the makerspaces bear the potentials for contributing to the social innovation process through community, collaboration and capacity building. The makerspaces are

in contact with a wide array of communities, and communities are important for social innovation as they are highly capable for defining the problems and the unmet needs that these communities face, which provides the necessary inputs for the stage of prompts, inspirations and diagnoses (2.2.1.1.). Defining problems in return ignites the possible solutions. While promoting collaborations during maker activities, the makerspaces are also collaborating with a wide range of actors, which enhances their chances to reach various communities. Moreover, especially in the cross-sector collaborations, the makerspaces are playing an intermediary role by connecting individuals, ideas and resources by allowing collaboration and experimentation. While maker education and activities are cultivating the capabilities of the communities, they are increasing the capacity of the communities to act.

Most importantly, the makers have generally high social awareness and they are sensitive to the problems happening around them; the makerspaces are also highlighting social problems and diverting the participants towards those problems during their activities. The makerspaces bear a great number of potentials to contribute to social innovation process. As social innovations unfold in an ecosystem that requires multidimensional mechanisms, they need to be conjointly improved in the context of Turkey. Building the social innovation culture and mindset both within the makerspaces and across the sectors might increase the number and the quality of cross-sector collaborations for improving the conditions for social innovation process.

APPENDIX A

Name of the Organization	Location	Info
ATÖLYE	Istanbul	It brings together a Creative Hub, a Strategic Design Studio, and an Academy to tackle wicked problems and create positive impact.
Onaranlar Kulübü	Istanbul	It is a community focusing on fixing, making and sharing.
İstasyon TEDÜ	Ankara	Established in 2016 as a part of TED University, it functions as a social innovation center with a multi purpose common making space.
Robotistan	Istanbul	An e-commerce site focused on maker tools such as Arduino, 3D printer parts. They also build makerspaces for different age groups at schools.
inzva	Istanbul	Established in 2017, inzva is a hacker community, focused on Algorithm and Artificial Intelligence, they focus on cultivating the talents of Turkish students through a series of events ranging from year-long study groups to camps.
Öğrenenler	Istanbul	A community focused on learning. They offer education programs or workshops for individuals, corporations or educational institutions.
Makers Ankara	Ankara	A community based in Ankara, focused on organizing events and workshops.
makerankara	Ankara	An e-commerce site focused on maker tools such as Arduino, 3D printer parts. They are also organizing maker workshops.
Makers Turkiye	Istanbul	Established in 2014, it is providing services and workshops to corporations, focusing on corporate innovation, creativity, coporate entrepreneurship and technology literancy.
Maker Atölye - Maker Çocuk	Istanbul	Established in 2015, the makerspace focuses on teaching fabrication tools and making culture to children, adults and organizations.
iskele 47	Istanbul	It works similar to a co-working space for freelancers; it looks like a hackerspace as well.
Özyeğin Üniversitesi Open-fab	Istanbul	The makerspace was built in collaboration of Istanbul Development Agency and Ozyegin University.
fabutopia	Istanbul	Established by a group of engineers living and studying in Istanbul, they also provide a creative environment for the Arabic speaking community in Istanbul.
benmaker	Bursa	Focused on 7-12 year-old children, it is a maker education workshop. In addition, they have a mobile maker lab.
Kadir Has FabLab Istanbul	Istanbul	As a part of Kadir Has University, it is established as an open making space.
Kreatif İşler	Eskisehir	It operates in two branches: a digital agency and a makerspace, located in Eskişehir.
Inno FabLab	Istanbul	Innofablab is integrated into the InnoCampus innovation and entrepreneurship program. The containers are set up in central, accessible locations on university campuses or in cities.
Ortak Atölye	Istanbul	It is a makerspace focusing on maker education for educators and students.
Atölye Vizyon	Istanbul	The makerspace has two branches, providing workshops and maker education to children between 4 -15 year old.
Atölye Atölye	Kocaeli	First makerspace, established in Kocaeli.

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