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Construction of Gendered Engineering Culture in Turkey

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ABSTRACT
This article is based on the findings of research that aims to understand the factors creating gendered aspects in the professional culture of engineering in contemporary Turkey. Based on the results of this study, I argue that the engineering profession's prestige in Turkish society derives from gendered codes and ideals. These codes mainly place the male engineer as the ideal type. The results of this study revealed that engineering is a prestigious profession in Turkey's society. The level of prestige is constructed upon factors such as being successful in math and natural sciences at high school, and the hierarchy between engineering departments and engineers' class position.

KEYWORDS
gendered engineering culture; social construction; engineering; women; Turkey

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INTRODUCTION

Women are underrepresented in the engineering profession. Their scarcity is echoed in daily expressions, in prejudices and in interaction styles. The gendered construction of the engineering professional culture is an extension of the patriarchal structure of societies. Thus, engineering culture (Robinson & McIlwee, 1992) cannot be separated from Turkey's general culture.

This study is about gendered construction of engineering in contemporary Turkey. I focus on the gendered discourse within and about the engineering occupation. My main argument is that gendered aspects in engineering are ideological and are based on a complex web of general and particular discourses around traditional gender roles, technical know-how, masculine "hardness" and feminine "softness". Although there have been women engineers globally since the 1930s, they have been accepted for only the past 30 years; women engineers have been able to earn a place in the labour market only recently. It is pointed out in a study by Canel et al. (2000) that male engineers' privileged position reflects their social class. The same study argued that women engineers who came to factories in the following years were, in contrast, from middle-class positions. Similarly, in Turkey, the first professional women engineers were also from middle- and upper-middle-class origins (Bayrakçeken-Tüzel, 2004) – that is to say, women could become engineers only if they had a certain level of economic and social capital. These studies show that the social relations within a profession are not only capitalistic but also interrelated bearers of class and gender.

As a result of this historical formation, men have always outnumbered women in engineering in the world as well as in Turkey. According to Eurostat (European Commission, 2012), full-time women researchers in science and engineering fields comprise 31% in EU countries. Despite their promotion and encouragement in the last couple of decades, in Turkey this ratio is 33.4% (Eurostat, 2012). As for the US, according to the labour-force status of recent engineering graduates, in 2012 the ratio of male engineers was 69% while the number of female engineers was 31%. In addition, the proportion of male engineering graduates was 82%.

Women in Turkey first found the opportunity to pursue careers in engineering during the Republican era. According to Gaye Erbatur, despite the open invitation from the state to women students, five years after the declaration of the Republic in 1928, women did not choose to attend engineering schools. With state intervention and via the support of the media, a year later, in 1927–28, the first two women students were registered in engineering schools (Gaye Erbatur cited in Naymansoy, 2010, preface). However, unlike the USA (Oldenziel, 2010), in Turkey there are no sources providing women's productive role in wartime technologies, though it is reported that women began to perform active roles in engineering sectors in the second half of the twentieth century (Naymansoy, 2010).

This study is one of the few studies on the relationship between gender and engineering in Turkey. It introduces a narrative-based, gender-oriented analysis of the relationship between gender and natural sciences and engineering careers in Turkey. There are very few studies comparing women and men engineers' experiences in the world and in Turkey. On the other hand, studies that analyze the masculine culture among engineers assert that the common type of masculinity in engineering might be oppressive to some men engineers as well (Cech, 2002; Cech & Waidzunas, 2011). Within the frame of this study, I accept that there are several masculinities, and men as well as women are affected by the operations of gender in engineering. Thus, I aim to address experiences of both women and men engineers by taking a feminist approach.

On this basis, this article tries to answer one question: *In what ways is gendered engineering culture created in Turkey?* It investigates the factors behind the creation of gendered engineering culture in Turkey with respect to engineering's social image. The concept of gendered engineering culture is taken as a composite of social definitions about engineering. It is argued that there is a complex relationship between the genders associated with engineering culture and how engineers are conceptualized and valued in Turkey's society (Öncü,1981).

Based on these factors, this study will examine the narratives of 25 women and 18 men engineers, focusing firstly on childhood experiences that would motivate the participants into choosing engineering as a profession. The secondary focus will be on engineering education, and the tertiary focus will be on work/life experiences in order to understand participants' experiences in terms of gender. I propose that gendered engineering culture is a process whose codes have been seeded and diffused in engineers' behavioral and communication schemes throughout their professional education and maintained within their work life (Cockburn, 1985; Wajcman, 1994). For this reason, it is crucial to examine participants' narratives in their own words to understand the construction of gendered engineering culture. This article will firstly introduce the theoretical framework with regard to literature review, and then the findings will be discussed in the context of an examination of gendered engineering culture.

LITERATURE REVIEW

This study follows a theoretical path of three steps. Firstly, the feminist critique of scientific inquiry will be examined. Then technology as the practice of science and gender will be discussed. Finally, the relationship between engineering and gender will be explored.To begin with, in their critique of the existing system of scientific examination, feminist theorists (Fox-Keller, 1985, 1996; Harding, 1986, 1987, 1994, 2008; Haraway, 1988; Wacjman, 1991) have claimed that a "cognitive authority" (Laslett et al., 1996, p. 1) has been granted to science because of its "objectivity" (Harding, 1986). Such privilege to science is mistaken because the practice of science, like any other branch of human endeavor, cannot be removed from the value systems and implicit biases and ideologies of its practitioners (Harding, 1991, 1989).

Harding indicates that science has allied itself to definitions of masculine dominance, which has a role in legitimizing scientific authority. According to her, "the epistemologies, metaphysics, ethics and politics of the dominant forms of science are androcentric and its applications, technologies, modes of defining research problems, and conferring meanings are not only sexist, but also racist, classist and culturally coercive" (Harding, 1987, p. 16). Harding's criticism indicates that it is not only the dualistic logic of modern science but also its power to control and legitimize, and create dominant forms and applications, which structurally keeps women away from scientific education and practice.
Fox-Keller (1985) also followed the logic of dichotomy in science and argued that the evolution of modern science helped to shape an ideology of gender. Although the dichotomies are ancient, the rise of modern science confirmed the association of mind, rationality, and reason with masculinity, while equating sociality and emotion with femininity. According to Fox-Keller, the ideology of modern science provided men with a new basis for asserting masculine self-esteem and male ideology over natural processes. In addition, over time, definitions of male and female roles were differentiated in ways that they were suited to the division between paid work and home work (Fox-Keller, 1985, pp. 44, 61).

Feminist intervention in science and technology studies asserts that there is a mutually shaping relationship between gender and technology (Cockburn & Ormrod, 1993; Wajcman, 2000, 2010) and that technologies are shaped by social circumstances and in return play a significant role in the shaping of social relations (MacKenzie and Wajcman, 1999). From this perspective, gender roles and relations are dependent on what is defined as technology. An extension of the ideological bond mentioned above, concerning gender and division of labour, is the question of which gender has technological competence and which does not. In terms of technological competence, women and men are unevenly associated with certain roles (Cockburn & Ormrod, 1993). Despite the historical record, men are usually thought to be producers of technology while women are accepted to be consumers of it (Pinch & Bijker, 1987).

Feminist scholars have explored the ways in which technological production is associated with masculine characteristics in professional culture. Indeed, feminist scholarship of science and technology has adopted a critical stance of feminist theory; the pigeonholing definition of "women", for instance, was criticized for being a generalization in the sense that it does not consider other aspects of identity such as culture, ethnicity, race, sexual orientation, or class (Hooks, 1984; Spelman, 1988).

The link between masculinity and engineering has been investigated in many studies. One common argument is that toughness, technical competence, hands-on ability, and the strength to tolerate hard and dirty working conditions are typical masculine images (Cockburn, 1981, 1983, 1987, 1993, 2009; Oldenziel 1999; Mellström 2002; Wajcman 2010; Kaygan, 2014). Cockburn's works (1981, 1983, 1987, 1993, 2009) highlight the relationship between engineers as the representatives of technology and the occupation's masculine structure. According to Cockburn, historically women have not failed to pursue careers in technology;

rather, they are prevented from doing so. In this view, technology is a medium of power – a kind of power that operates at the intersection of capitalist and patriarchal relations (Cockburn, 1987). According to Cockburn, engineering represents everything that is defined as manly: the control and manipulation of nature, the celebration of physical strength and machine in action, the tolerance and pleasure of dirt, grease, physical risk, hard work, accidents, and cuts (Cockburn, 1987, p. 129).

The numerical scarcity of women in natural science- and engineering-related fields has been a starting point for many pieces of research. Previous literature on the subject matter reveals that women engineers face multiple obstacles in their education and professional lives (Canel et al., 2000; Faulkner, 2000, 2007, 2009; Mellström, 2002, 2004; Miller, 2002, 2004; Wilson, 2002; Sagebiel & Dahmen, 2006; Jolly, 2007; Cockburn, 2009; Male et al., 2009; Peterson, 2009). These studies show that engineering education is functional in producing the image of the "real" engineer, by reproducing this image for the sake of occupational culture. Thus, this educational process is a continuation of childhood socialization, in that it ensures the perpetuation of stereotypical gender roles and is a preparation period for an engineer's working life (Robinson & McIlwee, 1992, p. 109).

There are a very limited number of studies concerning gender and engineering in Turkey. These studies were conducted particularly in the 2000s and consider women's underrepresentation in engineering occupations and their coping strategies. It has been noted by many authors that Turkey has been successful over the past 75 years in moving from being a society with no female participation in engineering to being one with a relatively higher participation than the USA or Europe (Tantekin-Ersolmaz et al., 2006; Bayrakçeken-Tüzel, 2004), yet many of the studies they produced have highlighted the discrimination women faced in male-dominated occupations (Zengin, 2000; Bayrakçeken-Tüzel, 2004; Smitha & Dengiz, 2010).

A study by Zengin in 2002 examined the gendered distribution of students in engineering departments in Turkey. It observed that females comprised 25% of students in engineering departments in Turkey in 1998. However, a closer look at the data reveals that the distribution of female students in engineering departments does not seem to be even; they are more significantly represented in some departments than in others. In this respect, Zengin groups engineering departments as follows:

> "Masculine" Engineering Departments: mechanical, civil, electrical and electronics, petroleum and metallurgical.
> "Feminine" Engineering Departments: food, chemical and environmental.
> (Zengin, 2002, p. 402).

From these definitions, we see that women are concentrated in departments related to traditional women's roles – care giver, food provider, being close to nature – while males gravitate towards "masculine" departments (Zengin, 2002, p. 403). Such segregation indicates that, in Turkey, traditional acceptances about gender determine women's choice of engineering discipline.

In regard to engineering education, Smitha and Dengiz (2010) conducted the biggest cross-sectional study of women in engineering, with 800 participants, and in focus groups women cited their mathematical and technical ability, the influence of relatives and teachers, and associated prestige and income as being major factors in their choice of career. Still, despite the fact that university students feel that their male peers and their professors are not biased against them, they nonetheless perceive a difference in opportunities for men and women and a lack of female role models. According to authors in Turkey, there has been a tendency for female engineering students with PhDs to prefer academic careers, while women in industry or government reported differences in the types of tasks that are assigned to them and their male colleagues, with men being employed in influential positions while women work in supporting roles (quality control, analysis, etc.) (Smitha & Dengiz, 2010, p. 56).

In short, the history of gender and engineering studies in Turkey is not very long. These contemporary studies conducted in/about Turkey note important aspects of gender in the engineering profession and suggest reasons for women's persistent underrepresentation.

OPERATIONALIZATION

The term *engineering culture* was originally used to describe the socially designed standard of behavior and interaction among engineers (Robinson & McIlwee, 1992). It is based on a stereotypical male gender role that works against women, and on masculinities which are closed to femininity and inconsistent with the ideal engineer stereotype. The concept of gendered engineering culture fits the definition with a slight difference: professional culture in engineering is gendered and socially constructed (Cockburn, 1985, 2009; Wajcman, 1994; Faulkner, 2000, 2007). That is to say, gendered engineering culture is not only experienced among engineers, but its gendered codes are also known, produced and reproduced by society as a whole – codes that are based on male-dominated discourses that have been monopolizing the terrain of technological innovation (Cockburn, 1993, 2009). In light of the stated theoretical framework, gendered culture of engineering is a discursive formation based on patriarchal ideology that equates males with rationality and objectivity, and assigns them as the ultimate producers of objective knowledge (Faulkner, 2000, 2007, 2009).

Many studies indicate that students learn the codes of masculine engineering culture at the undergraduate level (Hacker, 1981; Robinson & McIlwee, 1992; Nauta et al., 1999; Siann & Callaghan, 2001; Zengin-Arslan, 2002; Baker et al., 2002; Kent & Noss, 2002; Cech, 2005; Hartman & Hartman, 2007; Sonnert et al., 2007; Amelink & Creamer, 2010). It has been argued that, although university education emphasizes competence in math and engineering theory, the workplace is oriented towards application and requires hands-on skills.

This difference leads to different cultural codes in different periods of engineers' lives. University education might be rewarding for most students, regardless of gender, since academic performance plays a significant role. However, gendered engineering culture becomes more visible in the way male students receive more

value in practical courses, and as they create formal and informal male social networks (Robinson & McIlwee, 1992; Baker et al., 2002; Hartman & Hartman, 2007; Amelink & Creamer, 2010).

Gendered engineering culture, according to this study, shapes common-sense expectations and definitions about engineering which socially inform engineering culture. Within the limitations of this article, I will focus on social factors constructing gendered engineering culture in Turkey by relying on socialization, education, and work narratives of participants.

METHODOLOGY

In this study, I interviewed a group of 43 engineers composed of 25 women and 18 men who lived and worked in Ankara.[1] The older cohort was composed of 10 women and 8 men participants aged 40 and over, while the younger group was constituted of 15 women and 10 men engineers under the age of 40.
I conducted the interviews in Ankara. They were interactive and took approximately 40 minutes to one hour to complete, and were recorded with the interviewees' consent. Quotations were translated by a professional who is native in both Turkish and English.

In this research, I used and deployed a feminist analysis of the gendered culture of engineering, proceeding from the critical tradition which questions the gender of natural sciences and technology (Harding, 1986, 1987, 1991, 2008; Fox-Keller, 1982; Hacker, 1981; Cockburn, 1985; 1987, 1993, 2009).

The feminist debate focusing on the relationship between gender and engineering originated from discussions about gender and science (Cockburn, 1983, 1985; Cockburn & Ormrod, 1993). A contemporary article by Udén (2009) stated that gender studies in engineering need to conceptualize feminist understandings into the web of routines created and maintained in engineering practice so that they can be meaningful. According to Uden, previous studies of engineering focus on language or social construction, which make it impossible to address the core practices of engineering, hence the shift to laboratory settings, where the data gathered is generally generated by men. To counter this bias, feminist engineering needs "agency to fill in these situated experiences with numbering of women into core practices of engineering" (Uden, 2009).

In this study, I tried to take a critical stance regarding claims of objective knowledge and value subjectivity, which "implies partial, personal, intuitive knowledge that comes from the consciousness of a knowing subject situated in a specific social context" (Ramazanoğlu and Holland, 2002, p. 52). Such knowledge is personal and grounded in participants' experiences, ideas and self-beliefs to produce useful knowledge for political change. Obviously, it does not mean that I accepted no rules for validity; relativism in that sense would inhibit feminism from connecting experiences and gendered lives which are the basis for emancipatory political action (Ramazanoğlu & Holland, 2002, p. 57).

Introduction of the Sample

At the beginning of this research, I planned to listen only to women engineers' experiences, but as I reviewed the literature I saw that there were very few studies with men engineers participating. I decided that adding a male perspective would provide a better understanding of how the engineering profession is regarded as being steeped in a masculine culture. I therefore chose to draw on a larger sample by including men engineers so that I could achieve the aim of this study.

I also sought participants employed in different sectors. In this study, seven women participants were employed in the public sector, four of whom were academicians, one was self-employed and the rest worked in the private sector. Among men participants there were two academicians employed in state universities and three self-employed respondents, while the rest of the group worked in the private sector. Moreover, apart from academicians and self-employed workers, the participants in this study were working in engineer positions.

To gain a deeper understanding about participants' narratives, I conducted in-depth interviews. Such interviews align well with the aim of this study, since "the spontaneous exchange within the interview provide possibilities of generating insights with the interviewee as the narrator tells her own story in her own words" (Anderson & Jack, in Berger-Gluck & Patai, 1991). I also considered it relevant to apply an interactional research process in which both participants in each interview played an active role. Based on these points, semi-structured interviews with engineers constitute the first and the most important type of source in this study. Participants were contacted through the Union of Chambers of Turkish Engineers and Architects (TMMOB), the online initiative of women engineers, and via personal relations.

Data Collection

I began conducting interviews in December 2013. All interviews took place in Ankara, mostly in downtown pubs and cafes in the evenings, although some of the older participants, whom I reached through personal contacts, invited me to conduct interviews at their homes. The interviews were in-depth and took approximately 45 to 90 minutes to complete. I tried to be as flexible as possible so that they might yield as much information as possible. All interviews were voice-recorded and transcribed at the end of the field work.

I found that women engineers had initiative and were keen on being "listened to non-judgmentally, without interruption and with interest" (Lee, 1997, p. 54). In this sense, interviewing women was a reciprocal experience for me. Men, on the other hand, were distant at the beginning. Some opened up during the interview, some did not.

During transcription and interpretation, I divided the data into key words to make it easier to follow related declarations. I also included fictitious details concerning their employers and roles to protect their identities.

CREATION OF GENDERED ENGINEERING CULTURE ON THE SOCIAL LEVEL

This part of the study aimed to examine how gendered engineering culture was created in Turkey.

Male Engineers as Political Actors

Considered as the engine of modernization, professional engineering was introduced to Turkey in the early period of Republican reforms. From 1965 onwards, Turkey witnessed the rise of the male engineer as a political actor (Göle, 2008, p. 8). From 1965 until the 2000s, politicians with a background in engineering[2] became ruling figures in Turkey; Turgut Özal, Necmettin Erbakan and Süleyman Demirel, for example, were politicians whose occupational identity was a part of their political image. They were seen as representing the technological elite of Turkey's developmental politics (Göle, 2008), as developers of the country, and even its saviours from the economic burdens of World War II. They were arguably influential in cementing the engineering profession's image in the eyes of society. As one participant observed:

> An engineer needs to be good at mathematics and physics. If he is, the family expects big things from their child. They think that he is going to find a decent job. The neighborhood also creates expectations. Then comes the country's expectations. Smart students also have the psychology of becoming a big guy because we have Özal, Demirel, Erbakan… (Ömer, male electric and electronics engineer, 62 years old)

This technological elite were accepted as the "big guy" who knew what others didn't, who were educated and contributed to the country's development by building dams and bridges. Even though middle-class women were encouraged to enter the profession, because such publicly known examples in Turkey became symbols of managing politics and development, engineering became conceived as an appropriate profession only for men (Artun, 1999, 2000; Göle, 2008).

Just as Ömer noted, society expected engineers to be like Özal, Erbakan and Demirel, while engineers also thought they would become something more than an engineer. With regard to the aforementioned political movers and shakers, becoming an engineer also meant becoming part of the engine of development and improvement of the country. Given this social responsibility, as Göle suggests (2008), engineers represented the technological elite of Turkish politics.

Many of the elder cohort of participants in the study, who lived under the reign of such engineer-politicians, respected their abilities and achievements in the political arena, even if they did not agree with their political ideas. As a matter of fact, being a good engineer was seen as a positive quality in becoming a good politician.

The key characteristic required for an engineer to be able to contemplate social matters was considered to be knowledge of deduction (Göle, 2008). I asked participants to define the term *engineer* as it applied to his or her abilities. Ten male participants responded that an engineer is someone who has the potential for deduction, even though they had different world views and different of political positions, indicating that engineers in Turkey have a common ideology that makes

them believe they can change the world by using scientific processes (Göle, 2008). One of the male participants, Metin, gave the following definition of engineering and its power of deduction:

> An engineer is someone who understands the origin of a subject he does not know. A classic example is Necmettin Erbakan. He was an excellent engineer. Calling him a good engineer is an insult! What is this guy's project? How can I make this country religious? This was the guy's problem. Everybody was mocking him when everybody else was building tanks. Turgut Özal was also a very good engineer. Süleyman Demirel was excellent, also an excellent judge of character. … So, I think engineers make good politicians. If [an engineer] focuses on problem-solving in social matters, he makes a good politician. If he has talent, if he has intelligence, an engineer can play with you like a cat plays with a mouse. (Metin, male mechanical engineer)

The engineering environment in Turkey developed in the shadow of Western technological dominance, the dualism of public and private spheres, and the inevitable realities of patriarchal relations. Women participants of this study stated that engineering is always accepted to be a male-dominated occupation, referencing confrontations with male classmates and employees. Even in Turkey's reform period, women never saw themselves as being equal to their male engineer colleagues; rather, they were prepared to be assistants to male engineers (Naymansoy, 2010).

Based on this, I believe that the existence of the political figures mentioned above might have been especially influential on the older male engineers who participated in this study. As one participant noted, these politicians were seen as the "big guy", who was not only clever and ambitious but also managed to achieve professional recognition in the eyes of the public. Thus, it can be argued that engineering had gained historical importance and respect via these public figures.

Prestige of Engineering on the Social Level

Most participants in the study considered engineering to be a prestigious occupation, and such prestige was mainly felt by engineers through positive reactions from society such as praise, affirmation, trust and acceptance.

All participants in the study had preferred science and mathematics departments (MF)[3] during their high-school years so that they could apply to the engineering departments of universities. Interpreting from participants' experiences, the most important factor that channels young women to engineering is their ability to do math. The structure of the Turkish education system allows only those with mathematical ability to choose the engineering profession. For male students, math is a significant factor as well, but engineering appears to be a somewhat natural choice for them. According to the data generated by this study, men choose engineering because they are interested in technology and machinery, while successful women participants have no other choice than to be doctors or engineers. If they are to pursue a career in a STEM-related discipline, their path is not as linear as men's (Robinson & McIlwee, 1992, p. 45).

My findings show that the engineering profession has considerable social prestige for both women and men, yet the level of that prestige changes according to the engineering field, with some fields enjoying more prestige than others. In fact, prestigious fields attract more men than those populated by fewer women, which are argued to be lower in prestige.

In the next part of the study, I focused on the hierarchy of engineering fields. According to the participants, this hierarchy is unwritten, yet it is well known by engineers. Depending on the narratives, I examined the relationships between level of prestige with gender and considered the reasons for the existence of such a hierarchy among engineering fields.

Hierarchy among Engineering Departments

As previously stated, some – primarily male-dominated – fields of engineering are reported to have more prestige than others. Confirming the findings of Berna Zengin's (2000, 2002) study, data generated by the present study reinforces her suggestion that some fields of engineering are also accepted as more masculine. Most participants argue that there is a hierarchy between engineering departments both in the eyes of the public and among engineers, with mechanical, civil and electrical engineering considered to be at the top. Participants in the present study also stated that the hierarchy was an unwritten one, and that it was known not only by non-engineers but by everyone who had a connection to engineering.

According to the participants who held this view, the top three engineering fields offer more professional opportunities because their range of knowledge is wider. This brings more opportunities for better pay.

> There is an unwritten hierarchy between engineering departments. At the top is mechanical engineering. I think fields that engage with basic engineering sciences have a unique place in the hierarchy. What are those? Mechanical, civil and electric electronic. When you look at the origins of engineering, [an engineer being] a person who works with algebra, there should not be a field called food engineering. It is nonsense. Food is going to work with algebra? Chemical engineering is the same. Textiles is same. Mechanical, civil and electric, however – they have algebra as basics. (Tolga, male food engineer)

Here we come back to the importance of mathematics in engineering. Algebra, Tolga claims, is the origin of engineering. The most math-dependent disciplines are regarded as highly prestigious because mathematical ability is thought to be a prerequisite for an engineer. Fields that are not so math-dependent are not respected.

> Esin: With respect to the prestige coming from society, I put electric, electronic, computer, mechanical and civil engineering on top.
>
> Me: What about others, like environmental? Food engineering? Are they not basic engineering subjects?

> Esin: Of course they are not. Industrial, environmental, and so on, are not basic engineering. Industrial is … I mean, it is like nothing … Mathematics isn't so necessary. It does not require much intelligence. (Esin, female metallurgist and materials engineer)

In engineers' minds, mathematical ability equates to intelligence. They usually do not count verbal ability as a sort of intelligence, so they consider verbal fields to be peripheral and insignificant.

Another important aspect of the hierarchy was related to gender.
Within the suggested top three fields, women are fewer in number. As a result, the professional culture is mainly masculine and does not welcome women. The work of those engineering disciplines regarded as feminine takes place mainly in private spaces such as laboratories and offices. Chemical, food, environmental and industrial engineering are all performed in such enclosed places. This situation supports traditional space distinction among genders (Kaygan 2014), which observes that women stay in the private sphere even in the workplace. That is how their presence is accepted.

Women participants in this study stated that being an engineer is respected and being a women engineer is always a plus in the eyes of the public. One participant mentioned that a woman who becomes an engineer is regarded as "unbelievable." Though not voiced, there is a prevailing attitude that women are not accepted to be usual denizens of engineering departments in Turkey, where entry for women is difficult. A university qualification in engineering is perceived to be a difficult one to achieve, and above all engineering is perceived to be a male occupation, so it is considered to be more prestigious to be a female member of masculine engineering fields.

Engineering as a Middle-Class Profession

> Engineering is one of the occupations where class difference hits you in the face. In engineering workshops, from the construction yard to the factory, you remember class struggles, distinctions, reactions of people from different social classes. How they think, how they see … (Esra, female mechanical engineer)

As Esra clearly puts it, the factory is a place where a person can easily observe class struggles from workers' conversations and reactions. Everything that defines a person's position in the social class structure – values, behaviors, words, jokes, etc. – also determines their occupational class. Engineering in Turkey is mainly defined as a middle/upper-middle-class occupation, regardless of its income potential. And while the engineering class structure in Turkey is heterogeneous, many engineers also earn enough income to sustain middle/upper middle-class lifestyles. Therefore, social class becomes one of the most obvious factors that distinguishes an operator from an engineer in the factory.

While conducting research into both public and private sectors, Köse and Öncü (2000b) examined workers' economic class positions in Turkey. They found that engineers employed by small and medium-size firms do not hold a specific class position; they are either self-employed, management-based capitalist investors, or they are blue-collar workers employed by a small or medium-size company. However, in both cases, engineers rank higher than their non-engineer colleagues since they are seen as technical experts in their field (Köse and Öncü 2000, p. 13).

As for engineers in the public sector, Köse and Öncü state that, since the hierarchy in the public sector is different than that of the private sector, engineers' class positions are ambiguous, yet engineers tend to stay as an independent technical group between administrators and blue-collar workers (Köse and Öncü 2000, p. 13). Köse and Öncü's analysis shows that the majority of engineers find a middle or higher position in the industrial hierarchy, which creates the impression that engineering is a middle-class profession. Similarly, in my study, only two women and two men out of 43 participants claimed that they were from working-class families. Others defined their class position as middle-class.

One of the female participants, Zeynep, a geological engineer, told me that she grew up in a working-class family, and that for her becoming an engineer was a step up. She observed that, even if a person becomes an engineer, s/he needs a backup mechanism to do her/his job, which also intersects with financial opportunities.

> We were working class. I'm the daughter of a miner. When you're born in this position, even when you become an engineer you need to stand on your own two feet. My family didn't have opportunities to build a firm for me. (Zeynep, female geological engineer)

In addition to financial opportunities, some participants mentioned mobility in the social hierarchy. According to them, becoming an engineer provided this by bringing an increase in status.

> When we became engineers, we experienced upward mobility. In our time, engineering was respected and had more financial opportunities. (İrem, female chemical engineer)

> I graduated from Gülveren Lisesi in Ankara. My parents were workers. I was successful so I chose to be an engineer. It wasn't a conscious choice, though. I studied so hard. Being an engineer was prestigious in our environment. (Elçin, female metallurgist and materials engineer)

These observations suggest that, in Turkey, becoming an engineer is an attractive career choice due to the financial and social opportunities it offers.

Participants in the present study, both women and men, repeatedly told me that a freshman engineer needed to prove him/herself to blue-collar workers if he/she wanted to be accepted. It is argued that occupational respect was directly related to

ability, knowledge and problem-solving skills. Kaygan's research highlights the tension between male manual workers and women professionals, where male manual workers' resistance towards women's presence on the shop floor was reported to affect women's reputation within the organization (Kaygan, 2014, p. 64). For a male operator to accept an engineer, he/she had to pass some tests in the production process. These tests are unspoken and mainly conducted by male blue-collar workers to see if the engineer is professionally trustworthy. So operators need to know how to build a machine, while those in large factories also need to be able to follow a blueprint. What separates these workers from engineers, however, is that they are not a part of research and development. Therefore the most salient distinction between an operator and an engineer is their class positions. However, gender relations create a significant distinction when it comes to becoming professionally accepted by one's colleagues.

GENDERED IMAGE OF ENGINEERING PROFESSION IN TURKEY

> There is a saying in Turkey to express how desirable and marriage-worthy one was when they were were young: "So many doctors and engineers asked for my hand in marriage." Being an engineer or a doctor comes with high status. The reason is that studying is difficult and the earning potential is high. (Tolga, male food engineer)

Most people who grew up in Turkey in the 1970s are familiar with a typical scenario of Turkish movies: a young woman who says that her hand is wanted in marriage by doctors and engineers. She looks proud because being the bride of a doctor or engineer also shows that she is worthy.

It may seem like a joke, but men from these two professions are ideal sons-in-law for many parents because they earn good money, and only successful students are chosen for engineering or medicine. Therefore, the ideal face of engineering is a man's.

> You know, the wording is doctors and engineers … However, for a woman, it is not as prestigious as being a teacher. Being an engineer in this society … a male engineer, is accepted. (Esin, female metallurgist)

Esin underlines an important difference between women and men engineers: that engineering may be an appropriate profession for men but teaching is usually considered to be more suitable for women.

The fact that engineers in Turkish society are seen to be ideal sons-in-law clearly shows how the male gender associated with the profession has been generally accepted. Engineering is thought to be a profession mainly for men; if you're a woman, it's more acceptable for you to become a teacher. This finding leads to the discussion about the gendered image of the engineering sector in Turkey.

> The first image that springs to mind is that of a man – both for engineers and for others. As for women engineers, they're not part of the brotherhood.

> [How would you] get along with the men? You'll never be one of them. You're not one of them, anyway. (Aslı, female mechanical engineer)

As Aslı indicates, the first images that one thinks of when considering engineering are strongly related with stereotypes of gender. This ideological understanding of gender, overt or hidden, determines which gender is found suitable for which occupation. These images affect the whole working structure, where even if a woman manages to become an engineer, she can never be a part of "the brotherhood", as Aslı states. Historically, the occupation is seen as male-oriented (Oldenziel, 2010), even though in Turkey around 30% of engineers are female. Still women in this occupation feel they are not and cannot be a part of the established "brotherhood".

Engineers of various ages and both sexes had different perspectives about the gendered image of engineering. Three men (Akın, Ömer, Barış) and one women (Nevriye) participant in the 40-and-over category stated that the masculine image of engineering has changed over time. The increasing number of women engineers changed the general perception about the profession's gender. According to them, the profession is now more open to women, and working conditions are more suitable for them.

> Ten years ago, engineering was definitely a male occupation. Today, there are more women engineers. The balance has shifted in our favor over the years. Also, there are more women in the industrial sector in general. There was a metallurgist in the industrial sector, the first women in this region. I saw this woman and encouraged her by telling she was doing well. "If there were more like you, we'd become used to it, become more civilized." (Akın, male mechanical engineer, 60 years old)

Akın raised some interesting points. He mentioned that the occupation would become more "civilized" with respect to the increasing number of women engineers, indicating that men in engineering sectors would become accustomed to the presence of women. Akın perhaps thought that if they were "civilized," there would be more equal representation among the sexes in every profession. That does not necessarily mean, however, that women were welcome; indeed, Akın's narrative implies that masculine codes in the industrial sector are very strict and hostile to women.

CONCLUDING DISCUSSION

In this study, I attempted to examine the gendered construction of engineering culture in contemporary Turkey.

To begin with, findings of this study show that the engineering profession developed to become a socially prestigious occupation. Understanding the dynamics behind the social prestige of the engineering profession also helps to explain the creation of gendered engineering culture in Turkey.

Prestige was argued to be the most important feature of the profession's social image. According to the participants in the study, both men and women engineers are respected and admired by the public. Positive reactions were defined as affirmation, trust and acceptance. For women participants, surprise and more respect might be added to these reactions. Being a woman engineer is argued to be respected because the profession is accepted to be more suitable for men, and because it is especially difficult for a woman in both age cohorts – those under 40 and those aged 40 and over – to become an engineer.

The social prestige for both men and women engineers has two main origins: the ability to think analytically and the opportunity to find a middle-class job. In this frame, an engineer is supposed to be good at mathematics, problem solving and analytical thinking. For both women and men participants, the respected image is also based on educational success, the position of an engineering field in the hierarchy of engineering departments, and the potential of earning a decent income. The existence of women in this picture is unclear, however, as some participants mentioned that the female mind is stereotypically associated with verbal ability on the social level.

The elder cohort grew up in times when Turkey was ruled by engineer politicians, and they were raised to be "big guys" like them. The existence of important "big guys" in Turkey's politics also created a masculine culture within which engineering is associated with men. If these men also have intelligence they are seen as ideal husbands for women in this country. This is why I believe women participants of the same cohort did not indicate they took engineer politicians as role models, since these figures were not provided as role models for them by their environment.

When the engineering profession was brought to Turkey, it inherited all the associated masculine codes, which suited its patriarchical structure very well. I can argue that in Turkey, engineering culture is created on gendered principles. My findings above showed that theoretical requirements of engineering, combined with the rise of political figures in Turkey with a background in engineering, created an ideal image of engineering being suitable only for men. Women are not only historically excluded in this picture but their place has also never been constructed in terms of social definitions. That is why, when women become engineers in Turkey, they are met with a reaction of surprise and deep respect, for they have accomplished a mission culturally designed for men.

ENDNOTES

[1] See Appendix, 1

[2] The architect of neoliberal restriction in Turkey was the period's prime minister, Turgut Özal, a mechanical engineer. Like other engineer political figures, he originally came from a rural environment. His reform package was inspired by the IMF and was brought to fruition as a stabilization programme. Özal directed Turkey's politics following his party's election in 1983 until his death, in 1993, as prime minister (Zürcher, 1993).

Necmettin Erbakan was born in 1926. He was an engineer and academician who served as prime minister of Turkey for one year, but he participated in Turkey's politics from the 1960s until the 2010s. (Retrieved from www.necmettinerbakan.org)

Süleyman Demirel, the ninth president of Turkey, was born on November 1st, 1942. He also served as Prime Minister of Turkey for seven years. Originally an engineer, he was an important figure in Turkey's politics from 1964 until 2000 (Komsuoglu, 2008).

[3] At the end of the tenth grade, students are supposed to choose departments such as MF (math and science), TM (Turkish language and math), TS (Turkish language and social sciences), and finally foreign languages. Each department provides courses geared to each student's orientation. To be able to choose one of these paths, students' grades need to be above satisfactory in related courses. Such categorization determines students' preferences in the university entrance exam. An MF student can choose only occupations in which mathematics and science knowledge is fundamental – engineering, medicine, for example –whereas law, psychology, and political sciences are appropriate choices for TM students.

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APPENDIX 1: Profile of Participants

	Name*	Gender	Age	Education	Employment	Sector	Engineering Field
1	Aslı	Woman	33	Bachelor	Full Time Engineer	Private	Mechanical Engineering
2	Nevin	Woman	33	Bachelor	Full Time Engineer	Private	Mechanical Engineering
3	Nevriye	Woman	55	PhD	Academician	Private	Chemical Engineering
4	Ayşe	Woman	28	Bachelor	Full Time Engineer	Public	Geological Enginering
5	Serpil	Woman	30	Bachelor	Full Time Engineer	Public	Metalurgy and Materials Engineering
6	Derya	Woman	32	PhD	Academician	Public	Civil Engineering
7	Pınar	Woman	31	Bachelor	Full Time Engineer	Public	Geological Engineering
8	Berrin	Woman	32	Bachelor	Full Time Engineer	Private	Geological Engineering
9	Emine	Woman	45	Masters	Full Time Engineer	Private	Metalurgy and Materials Engineering
10	Fulya	Woman	35	Bachelor	Full Time Engineer	Private	Electrics and Electronical Engineering
11	Mine	Woman	50	PhD	Academician	Public	Civil Engineering
12	Gonca	Woman	60	Bachelor	Full Time Engineer	Public	Geological Engineering
13	Çiğdem	Woman	28	Bachelor	Full Time Engineer	Private	Mining Enginering
14	Elçin	Woman	36	Bachelor	Full Time Engineer	Private	Metalurgy and Materials Engineering
15	Rüya	Woman	43	Bachelor	Full Time Engineer	Private	Environmental Engineering
16	Fatma	Woman	40	PhD	Academician	Public	Computer Engineering
17	Semra	Woman	40	Bachelor	Full Time Engineer	Private	Electrics and Electronical Engineering
18	Ebru	Woman	34	Bachelor	Full Time Engineer	Private	Mining Enginering
19	Birgül	Woman	33	Bachelor	Full Time Engineer	Private	Mechanical Engineering
20	Esra	Woman	55	Bachelor	Full Time Engineer	Private	Mechanical Engineering
21	Zeynep	Woman	45	Bachelor	Full Time Engineer	Self Employed	Geological Engineering
22	Elif	Woman	33	Bachelor	Full Time Engineer	Private	Mining Enginering

23	İrem	Woman	55	Masters	Full Time Engineer	Private	Chemical Engineering
24	Serap	Woman	33	Bachelor	Full Time Engineer	Private	Geological Engineering
25	Esin	Woman	34	Bachelor	Full Time Engineer	Private	Metalurgy and Materials Engineering
26	Ahmet	Man	37	Bachelor	Full Time Engineer	Self Employed	Mechanical Engineering
27	Akın	Man	60	Bachelor	Self Employed	Public	Mechanical Engineering
28	Yavuz	Man	32	Bachelor	Full Time Engineer	Private	Mining Enginering
29	Vural	Man	40	Bachelor	Full Time Engineer	Private	Mechanical Engineering
30	Yiğit	Man	33	Bachelor	Full Time Engineer	Private	Mechanical Engineering
31	Göker	Man	34	Bachelor	Full Time Engineer	Private	Aerospace Engineering
32	Mustafa	Man	67	PhD	Retired Academician	Public	Mechanical Engineering
33	Burak	Man	29	Bachelor	Full Time Engineer	Private	Civil Engineering
34	Bahadır	Man	34	Bachelor	Full Time Engineer	Private	Environmental Engineering
35	Metin	Man	62	Bachelor	Full Time Engineer	Private	Mechanical Engineering
36	Omer	Man	62	Bachelor	Full Time Engineer	Self Employed	Electrics and Electronical Engineering
37	Tolga	Man	35	Bachelor	Full Time Engineer	Private	Food Engineering
38	Emrah	Man	33	Bachelor	Full Time Engineer	Private	Mechanical Engineering
39	Volkan	Man	38	Masters	Full Time Engineer	Private	Mechanical Engineering
40	Murat	Man	54	Bachelor	Full Time Engineer	Private	Civil Engineering
41	Kerem	Man	42	PhD	Academician	Private	Computer Engineering
42	Can	Man	34	Masters	Full Time Engineer	Private	Computer Engineering
43	Barış	Man	72	Bachelor	Retired	Public	Electrics and Electronical Engineering