Design and Technology Education: An International Journal

29.1

Formation of Industrial Design Culture from Educational to Professional Life

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Abstract

Although the professional culture of designers has been emphasized as a peripheral issue in various fields of study in design, such as design culture and design management, it has rarely been the central topic of research. However, studies from other professional fields have demonstrated the significance of studying professional culture, especially its formation in higher educational contexts, as it has direct implications on professional status and career prospects of these professions' members. This paper aims to redress this gap by exploring how the professional culture acquired in industrial design education shapes industrial designers' work experiences in manufacturing companies? It focuses on the context of Turkey and empirically draws on interviews with industrial designers who have work experience in large-scale manufacturing companies. Interviews reveal insights into industrial designers' perceptions of the profession, experiences in undergraduate education, adaptations to professional life, and professional experiences in manufacturing companies where they collaborate with other professions, where cultural disconnect becomes visible. The qualitative data analysis highlighted the significance of being a community and having flexibility in space and time in industrial design's professional culture in the examined context. The findings underline collaboration and teaching of soft skills such as communication and teamwork as implications for industrial design education.

Keywords

Industrial Design Education, Design Culture, Professional Culture, Designer-Engineer Relations, Collaboration in Design, Manufacturing Companies

Introduction

Industrial design is a relatively young profession compared to architecture and engineering. Its scope continuously changes according to innovation and technology developments (Tovey, 1997). Over the years, the industrial design profession has been the subject of many studies, and its context has been defined many times according to its position during the studies (Tovey, 1997; Micheli et al., 2012). According to Er et al. (2003), after World War II, when industrial design first spread globally, its context was limited to industrialization and modernity. In the 1950s and 1960s, mass production and consumer goods were added to industrial design. During the 1970s and 1980s, technological developments and the emergence of human-machine interface (HMI) (Kang & Seong, 2001) and human-computer interaction (HCI) (Fallman, 2003) created new industrial design needs, and the required skills of industrial designers changed accordingly (Wang, 2022). Today, the World Design Organization (WDO) provides a shared and detailed description of the industrial design profession as designing and further developing consumer goods, systems, and services that enhance human lives and sustainability

(WDO, n.d.). In this definition, essential skills like problem-solving, creativity, and business relationships are also emphasized.

WDO's definition highlights six vital aspects of contemporary industrial design practice. These are (1) human-centred, (2) production-based, (3) creative and abstract, (4) have critical thinking," (5) "have a broad scope," and (6) "built with experiences." These aspects are interrelated (see Figure 1). Since the beginning of the profession, designers' human-centred outputs must be (mass) producible, commercial, and adaptable to the market. Thus, this situation entails creativity and originality. Designers also need to push the boundaries of disciplinary approaches and ideas, be open to incorporating other discipline's concepts into design (Dykes, 2009), and broaden their skills, and be able to work with other disciplines (Kimball, 2013). Lastly, since the profession is creativity-based and deals with human needs and experiences, it is firmly embedded in everyday life and experiences.

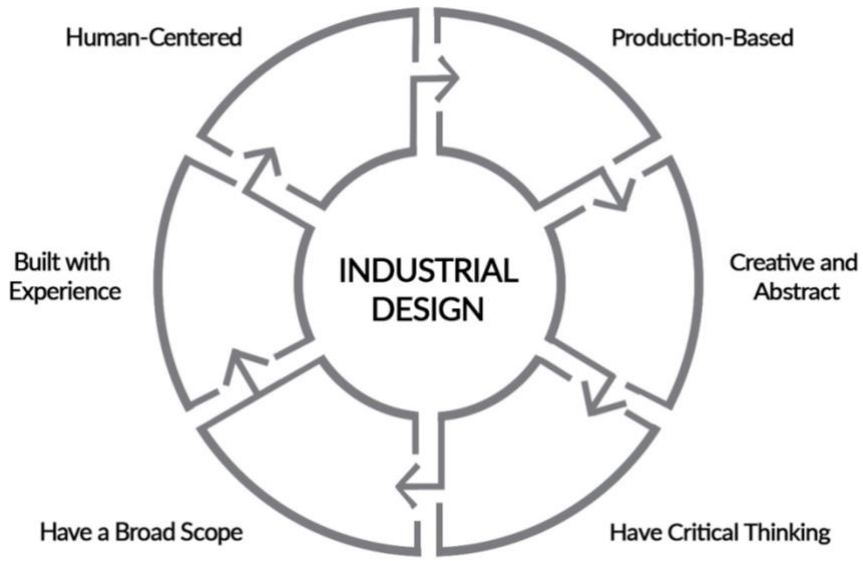

Figure 1. Aspects of the industrial design profession

Equipped with all these knowledge, skills, and competencies, industrial designers take part in design, new product development (NPD), and research and development (R&D) processes in manufacturing companies (Hertenstein et al., 2005). Designers, however, usually constitute a minority in manufacturing companies since manufacturing companies are often dominated by engineers (Kim & Lee, 2014; Marinas et al., 2021). As a result, the organizational culture of manufacturing companies tends to be aligned with the professional culture of engineering, and being a relatively smaller group compared to their non-designer colleagues makes designers less influential in decision-making processes (Molotch, 2003). This is especially a consequence when the top management is also dominated by engineers (Kaygan, 2014). Different and even conflicting professional cultures lead to different work experiences for engineers and designers in manufacturing companies. Beyond this, previous research has shown that to what extent one's professional culture is aligned with the organizational culture has implications for their status in the company, and thus, as companies become more accustomed to the design culture, the professional status of designers would improve in manufacturing companies (Kim & Lee, 2014).

Although the professional culture of designers has been emphasized as a peripheral issue in various fields of study in design, such as design culture (Julier, 2014) and design management (Hertenstein et al., 2005; Kaygan, 2014), it has rarely been the central topic of research. However, studies from other professional fields, such as architecture (Abdullah et al., 2011) and engineering (Dryburgh, 1999), have demonstrated the significance of studying professional culture, especially its formation in higher educational contexts, as it has direct implications on professional status and career prospects of these professions' members. This paper aims to redress this gap by exploring the following research question: *How does the professional culture acquired in industrial design education shape industrial designers' work experiences in manufacturing companies?*

The context of this research is Turkey, where the beginning of the 21st century has become a turning point for the industrial design profession due to the increased awareness of the value of design and innovation in the industry, the growing demand in small and medium-sized enterprises (SMEs), and initiation of national design policies as well as financial support programs by the state institutions (Hasdoğan, 2009). A recent study that traces the change in the employment of industrial designers between 1984 and 2018 in Turkey shows a sharp increase in the number of industrial designers, most of whom work in in-house positions, including manufacturing companies (Kaygan et al., 2020). In a close-up study, Hasdoğan (2011) examines the sectoral preferences of industrial designers in Turkey and finds that 28% of industrial designers in Turkey primarily work in furniture and interior design companies, and 24% choose to work in industries focusing on electrical household appliances. Both industries offer work environments where industrial designers work primarily with engineers (Kim & Lee, 2014). Thus, Turkey provides a rich context that explores the above-formulated question. The empirical basis of the study comes from semi-structured interviews with industrial designers who study industrial design and work in manufacturing companies in Turkey.

Industrial Design Education, Design Studio, and Its Culture

The conflicts between the Arts and Crafts Movement and the Industrial Revolution significantly shaped the industrial design profession and its education (Giard, 1990; Emilson, 2014). The movement's focus on the artistic and humanistic qualities of everyday objects, combined with the mass production emphasized by the Industrial Revolution, influenced the development of industrial design as a profession. These debates, revolving around quality versus quantity, heavily influenced the perception of industrial design. Furthermore, discussions on industrial design education merged traditional art, craft, and apprenticeship approaches (Friedman, 2000; Kolko, 2005; Başar & Ülkebaş, 2011) with emerging manufacturing techniques, knowledge, and theories in academic settings (Giard, 1990). Mainly rooted in the Bauhaus movement of the early 20th century, industrial design education emphasizes the synthesis of art, craft, and technology to create functional and aesthetically pleasing products (Papanek, 1972). This holistic approach to design education laid the groundwork for integrating design thinking, human factors, and engineering principles into the curriculum. The Bauhaus Design School within the German education system provided formal industrial design education through the university system, blending art with research to establish contemporary industrial design education (Betts, 2007; Noel, 2020). Today, many globally acclaimed industrial design educational institutions have emerged, influenced significantly by the teachings and philosophies of the Bauhaus school.

Industrial design education strongly emphasizes interdisciplinary collaboration, learning by doing (Dewey, 1980), and problem-solving (WDO, n.d.). Therefore, the design studio system within industrial design education emerged as a response to the need for hands-on, experiential learning that mirrors real-world design practice through collaborative projects (Cross, 2006). Rooted in the Bauhaus tradition, which emphasizes practical, project-based learning, the design studio system places students in a collaborative environment where they engage in iterative design processes, critique sessions, and project-based assignments (Emilson, 2014). Notably, the Ulm School of Design (HfG Ulm) in Germany, founded in 1953, played a significant role in formalizing the design studio system within industrial design education. Under the guidance of influential designers such as Max Bill and Hans Gugelot, HfG Ulm pioneered a pedagogical approach that prioritized studio-based learning, interdisciplinary collaboration, and the synthesis of theory and practice (Noel, 2020). The studio culture in design education fosters teamwork, creativity, and iterative design processes, mirroring the collaborative nature of professional design practice.

Industrial design education is deeply entrenched in cultural values that shape the profession's ethos (Green & Bonollo, 2003), notably through fostering interdisciplinary collaboration and problem-solving within design studios (Yenilmez & Bağlı, 2020). This emphasis on collaboration reflects the recognition of the multifaceted nature of contemporary design challenges, necessitating the integration of expertise from various disciplines. Interdisciplinary collaboration cultivates a culture of teamwork, innovation, and holistic problem-solving within the industrial design profession and education (Kolko, 2005). Through collaborative projects and interactions with peers from diverse backgrounds, students learn to appreciate different perspectives, leverage complementary skills, and co-create solutions that address complex societal needs (Emmitt & Ruikar, 2013). This studio-based approach instils technical proficiency and fosters cultural values such as curiosity, experimentation, and adaptability. By presenting students with a dynamic and supportive learning environment, design studios play a pivotal role in shaping the cultural values of industrial design education, preparing graduates to thrive in the ever-evolving landscape of design practice.

Therefore, industrial design education serves as the crucible where the professional culture of industrial designers is formed and nurtured. By imparting interdisciplinary knowledge, fostering collaboration, and instilling cultural values such as user-centricity and experimentation, design education shapes the ethos and identity of designers. By adapting to industry dynamics and emerging trends, design education ensures graduates have the skills and competencies to advance in a rapidly evolving design landscape. As the field of industrial design continues to evolve, design education will play a central role in shaping the profession's future and empowering designers to drive innovation, sustainability, and positive social change.

Cultural Forms of Professions and Organizations

Culture is a term used in various social sciences, such as sociology, anthropology, and education. While different fields have their perspectives and understanding of culture, they commonly refer to the definition of culture by Hofstede et al. (1990), which states culture's seven distinctive features, including (1) a holistic view, (2) close relations with traditions and customs, (3) rigid and relatively challenging to change nature, (4) human-scale, (5) subjective nature, (6) hidden meanings, and (7) personalized forms that define itself. In a more recent

definition, Alvesson and Svenningsson (2016) suggest that culture can be defined as guiding knowledge and practices, meanings, values, and norms shared among group members.

Shaped by its disciplinary knowledge and specialized skills, an authority that stems from expertise, formalized curricula, learning environments, and code of ethics, every profession develops its culture (Slusser et al., 2018). Through the shared priorities, values, norms, objectives, and expectations, a profession provides its members with recognized standpoints and "regularized ways of assigning meaning and responding to things" (Bloor & Dawson, 1994; Gubrium & Holstein, 2009, p.162). Interpersonal relations and the shared educational background of the same group of professionals lead to the emergence of their professional culture (Dryburgh, 1999; Johnson et al., 2009). Members of a profession are well-defined because they go through the same formal higher education and generally have common interests, limitations, and challenges in their professional lives.

Organizational culture also comprises shared interests, values, meanings, norms, definitions, and knowledge that direct certain groups of people's actions and behaviours (Schein, 2010; Costanza et al., 2016). While organizational culture could be considered how things are done or managed within a well-defined organization (Sun, 2008), professional culture is located beneath organizational culture as a subculture (Hofstede, 1998). Specifically, organizational culture contains various professional cultures. Different professional cultures within an organization bring along diverse cultural aspects. These aspects shape the organization's culture and, in turn, shape the experiences of the members of these different professions. Another difference between professional and organizational cultures appears in the learning process. While people first encounter and adapt to their professional culture in undergraduate education (Johnson et al., 2009), they learn and become a part of their organizational culture starting from working at the organization (Palos & Veres Stancovici, 2016). While the former is unique to the profession and includes a one-off learning process, the following changes from one organization to another. In every organization, people go through a new learning process.

The research examines the aspects of industrial designers' professional culture. Beyer's 1984 dated "List of Definitions of Frequently Studied Cultural Forms" (as quoted in Beyer & Trice, 1987, p.655) states the primary cultural forms in organizations as follows: *rite, ritual, myth, saga, legend, story, folklore, symbol, language, gesture, physical setting, and artifact.* This list provides the analytical framework for exploring these aspects. While reviewing recent studies, it was identified that there had been a tendency to rethink and combine these cultural forms under more general categories in the last two decades. For instance, while some research studies discuss rites and rituals within the organizational culture (Sueldo & Streimikiene, 2016), some research studies discuss physical setting and artefacts together with space (Kallio et al., 2015). Gabriel (2004) also links myth, legend, and story while discussing organizations. Considering the extant literature, we organized the list into five main categories; "(1) stories, (2) language, (3) social relations, (4) physical space and artifacts, and (5) dress and appearance norms", accordingly (see Figure 2).

Figure 2. Cultural forms in professions and organizations

Stories are based on myths, and actual events combine truth and fiction (Beyer & Trice, 1987). A story is an acclaimed form of culture, demonstrating many insights into the shared norms, meanings, and values in professions and organizations (Gabriel, 2000). As Brown and Duguid (2001) highlighted, stories are vital in knowledge sharing, organizational learning, and sense-making within professional communities. In organizations, stories are performed in three paths. First, stories pass on culture among generations (Czarniawska, 2004); second, they introduce and depict a distinct culture to the outside world (Abdullah et al., 2011). Third, organizations' cultural change can be revealed via stories (Hansen et al., 1994).

Language constitutes another form of expressing culture in organizations, where members of a profession promote knowledge creation and sharing (Lauring & Selmer, 2011). Language provides information on, first, the shared vocabulary and jargon within a professional group. For instance, while people from various disciplines, such as accounting, marketing, and engineering, adopt the term *oral presentation*, designers from creative industries adopt the terms *juries* or *critiques* to refer to oral presentations (Dannels, 2005). In that context, while critiques refer to the students' weekly oral presentations regarding their design project, the term juries refers to the students' final oral presentations at the semester's end. Second, language reveals how a term may have multiple meanings to different groups of people. In that context, design and engineering students understand production concepts differently, such as models, mock-ups, and prototypes. This difference comes from the fact that, in engineering education, the aim of using physical models is to test whether the design works or not, while in design education, physical models are not always the end products; instead, they are features of the creative process (Kaygan & Demir, 2017).

Culture also becomes visible in social relations within professions and organizations. While looking at the context of design studios, Dannels (2005) states that because design studios are the environments where students spend most of their time talking, collaborating, socializing, eating, or sleeping when they want to, studios are considered flexible environments. These informal relations and inner dynamics of design studios are integral elements where culture becomes visible.

Physical space and artifacts create another cultural form in organizations together. According to Beyer and Trice (1987), physical settings surrounding people and artifacts, human-made objects, offer grounds for culturally rich activities. An organization's physical setting includes many influential artifacts in establishing meaning. Design studios, where designers study/work and socialize, appear as a physical setting that has been examined (Abdullah et al., 2011). In design studios, design work's abstract and creative nature has encouraged designers to socialize and utilize collaborative design methods, such as co-creation and idea generation, with fellow designers and academics. Abdullah et al.'s (2011) research suggests that architecture

students are determined to study in the design studios while focusing on the design development and production stages because of the design studio's large space and open plan layout, which helps quick and effective information transfer and sustains collaboration. In these spaces, design sketches (Vyas & Nijholt, 2012) and architectural models are considered artifacts that define the space and give a sense of belonging to the members of the space.

Dress and appearance norms act as the final cultural form in the context. They are the most visible aspect of professional culture and are closely related to organizational hierarchy and power relations (Rafaeli & Pratt, 1993). While uniforms give a sense of belonging to their users, their primary purpose is to show status, rank, and qualifications with the badges' help. Professional groups may have different and contrasting dress and appearance norms in the same organization. Kaygan's (2013) research shows that while engineers and marketing people are expected to wear formal clothes in manufacturing companies, designers have more flexibility in wearing casual clothes due to their association with creativity. However, their casual style depicts designers as less suitable for managerial positions with these companies, which directly points to a lower status. Thus, dress and appearance norms strongly affect people's competence and suitability for specific roles and positions.

The description of these five ways through which culture is constructed, sustained, and becomes visible provides the analytical framework for understanding how industrial designers learn and internalize the professional culture of industrial design in their education. Additionally, it presents how this culture affects their work experiences in manufacturing companies, where designers constitute a smaller percentage of employers compared to engineers.

Research Design

As this study is concerned with the relationship between the professional culture of industrial designers that they internalized through undergraduate education and their professional experiences in manufacturing organizations, we adopted a methodological approach that fosters understanding their individual experiences. Since individuals' feelings and interpretations of past experiences are neither observable nor reproducible (Merriam & Tisdell, 2015), interviewing was selected as the method for data collection that enables people to share their experiences in their own words and by making sense of them (Matthews & Ross, 2010).

In the sampling, two selection criteria were applied. First, participants were expected to be industrial designers who graduated from universities between two and six years ago so that participants would have some work experiences to reflect on. However, their memories regarding undergraduate education would also be relatively fresh. Secondly, they were expected to have at least a year of professional experience in large-scale manufacturing companies since they offer multidisciplinary work settings where industrial designers work with colleagues from different professional cultures.

In-depth, semi-structured interviews were conducted with 15 industrial designers consisting of eight women and seven men (see Table 1). They are industrial design graduates from six universities in Turkey and have work experience in six cities.

Table 1. Overview of the interview participants

GENDER	INDUSTRY	WORK EXPERIENCE
Woman	Consumer Electronics	1,5 years
Woman	Defense	1 year
Woman	Automotive	3,5 years
Man	Defense	2,5 years
Man	Automotive	4 years
Man	Urban Equipment	3 years
Man	Consumer Electronics	3 years
Woman	Automotive Equipment	4 years
Man	Building Materials	2 years
Woman	Furniture	1,5 years
Woman	Glassware	3,5 years
Man	Furniture	6,5 years
Man	Automotive Equipment	2 years
Woman	Yacht Design	1,5 years
Woman	Furniture	3 years

Interviews lasted 70 minutes on average. An interview guide containing 29 questions on the industrial design profession, its education, and professional life experiences was used (See Appendix A). The questions explore industrial designers' perceptions of their profession, their purposes in choosing industrial design, their early encounters with the profession in education, and their interactions with their colleagues. All interviews were audio-recorded with the informed consent of participants and fully transcribed. Transcriptions were analysed using the computer coding software ATLAS.ti analysis software.

To analyse interview data, we used template analysis, a qualitative data analysis method that uses templates for thematically organizing and analysing the data (King, 2012). The researcher creates a list of priori codes (initial template) corresponding to the themes that emerge at the end of the literature review. The initial template is revised as the researcher reads and interprets the transcripts. The template analysis method is frequently used in cases working on previously selected themes with existing sets in qualitative research (King, 2012). In this research, the five aspects of professional culture identified through the literature review, 1) stories, 2) language, 3) social relations, 4) physical space and artifacts, and 5) dress and appearance norms", were taken as the themes of the initial template. As the coding was carried out, inductive themes also emerged and expanded the template. These include 6) being a community, 7) flexible work nature, and 8) working long hours. Accordingly, the template was revised, and the findings were organized as presented in the following section.

In addition to identifying the themes in the coding, we also distinguished between three components of the research question: (1) industrial design profession, (2) industrial design education, and (3) industrial designers' work experiences. Such a distinction was essential since we aim to investigate the influence of undergraduate education on the professional experiences of industrial designers in their work lives. The codes under the industrial design profession theme are mainly related to the basic skills and knowledge of professional practice. Examples of codes under this theme include creativity, abstract, working types, motivations,

and ideals. The codes under this theme relate to how the participants define the profession and the main reasons behind their desire to orient toward this field. The codes under industrial design education mainly focused on the participants' experiences in their educational life. Within this theme's scope, the participants' knowledge, and experiences regarding the educational approaches in other schools were analysed. Some of the codes under this theme are design studios, learning from each other, multitasking, collaboration, and curriculum. In addition, the positive and negative points that the participants experienced in their education were included under this theme. The industrial designers' work experience theme contains codes related to the participants' past and current work experiences. This theme includes codes such as departments, workflow, teamwork, and collaboration with engineers and blue-collar workers. As in the education theme, the participants' positive and negative work-life experiences are also included under the work experience theme.

Findings

In accordance with the themes and codes, findings are presented under two main sections: (1) learning and adapting to the professional culture in industrial design education and (2) work experiences of industrial designers in manufacturing companies.

Learning and Adapting to the Professional Culture in Industrial Design Education

Interview data suggests that participants identified the prominent features of industrial designers' professional culture in three headings: being a part of a community, having flexibility in working time and space, and having the ability to work for long hours based on their encounter with the profession in undergraduate education. Participants stated that they spent most of their time in their design studios during their undergraduate education, where a sense of community was established. In the studios, where they spend time out of course hours, they study, socialize, and learn from each other. They indicated that, since in Turkey, design departments have smaller numbers of students than the departments of engineering or management, industrial design students know each other better and become closer, thus learning to act as members of a community. Industrial designers learn to be flexible while working in time and space, which results in working for long hours. Participants stated that industrial design students spend long hours in their design studios in their undergraduate education due to design practice's abstract and creative nature. Moreover, since they considered that design practice requires many iterations until satisfied with the outcome, they identified themselves as perfectionists who must work for long hours, day and night. The account below provides information about the subject.

> *"It [industrial design education] teaches us to think in detail and look at things from different angles. Indeed, you are thoroughly examining the consequences of things. It makes you a perfectionist; you must be a perfectionist. You need to look over a job, you do not need to be quick, and you need to search for something different."*

The long and continuous design process cycle puts industrial designers in constant questioning and self-criticizing. Design education's subjective, abstract, and creative nature is pivotal in creating perfectionist industrial designers. The interviews show a strong connection between perfectionism and industrial designers' work satisfaction. The statement below strengthens perfectionism in industrial design education while showing the link between perfectionism and work satisfaction.

> *"They [senior students] came and said goodbye to sleep. I was very determined; no, I will go to sleep. Then I realized that it was not like that. Because of the satisfaction… If I could already do something okay, our profession would not exist if there is such a thing as reaching the best. Then the best of everything will be designed, and everything will be done."*

The lack of absolute truths in the abstract design process creates a constant need for work that affects industrial design students' satisfaction levels. Because this statement acts as a working principle in the industrial designers' realities, it first appears in academic life. Then, it becomes a part of the profession and links perfectionism with work satisfaction.

Above, the five cultural forms of professions, including "stories, language, social relations, physical space and artefacts, and dress and appearance norms"), are defined. "Being a community, flexibility in time and space, and long working hours" provide examples of these five cultural forms. Most participants indicated that since industrial designers mainly studied within their community in education, they did not learn much about the different cultures of other disciplines. In their design studios, they spend days and nights among themselves. They do not just study or exchange ideas but also share stories, values, and assumptions, which led to the designers' community's formation. While all the participants commented on this topic, one stated that:

> *"An engineer friend in the studio said, Are you always here? We are going. I said, no, we have got a course to attend. Then he answered, Is it here, too? Yes, it is here because this is the studio. All our classes are in the studio. We were sleeping here, and we were eating all our food here. That is why the studio was like our home. We would not take many courses from other departments."*

The common language also substantially impacts the formation of their professional culture. Industrial designers stated that they have terms and sayings for their departments and projects. These terms are either formed due to professors' famous sayings, senior students, or misspelled words among themselves. When asked about the common language and jargon in undergraduate education, industrial designers provide many examples, such as the one below.

> *"We heard a lot of; This would fall; from our professors. It was about overturning the model we made or when the project was unsuccessful."*

Today, new sayings among students are also slowly forming their place in the common language. The statement below shows how students form their language within their community.

> *"Close fit is used only among students and as a connection detail that teachers never understand. We heard this in the senior classes' juries. It is the plastic detail that fits tightly together, but there is no such expression."*

Regarding physical space and artifacts, industrial designers emphasized the studio and its surroundings. Design studios have rules based on mutual respect instead of strict ground rules and have a social structure based on a multifunctional home concept that creates a fundamental part of industrial designers' professional culture. Industrial designers consider

their design studios as their homes. In that sense, studios' physical surroundings and elements strengthen professional culture visibility.

> *"Studios were open 24/7, and we could use them anytime. They were beautiful because of the high ceiling. Our stools were terrible, but we still loved them. Studying was enjoyable because our studios were the places that belonged to us at school. We had a connection, could go in and out, and could study comfortably."*

Studios, where designers study within their community, create flexibility and a sense of belonging among industrial designers. Additionally, industrial design education requires a lot of free space and many surfaces to work on. Design studios and their entire content fulfil these requirements and become essential parts of industrial design. The statement below emphasizes the importance of the idea of design studios as homes by stating:

> *"The design studio is critical because you start a project, you draw it in 2D/3D. Then, you are modelling and prototyping, which are not things that you can do at home. You usually need large areas because there are many team projects."*

Lastly, dress and appearance norms were mentioned concerning flexibility, but only as little as the other cultural forms. Most statements cover the flexibility achieved by social relations, language, and physical settings. However, participants stated that students prefer to be dressed flexibly within their communities due to the intense and long study periods. The following account states an industrial designer's point of view towards dressing in industrial design education.

> *"I remember juries… I went out with my tracksuit covered with paint because I had no time to dress appropriately. I do not remember ever hearing such negative comments [from academics]."*

This flexibility is in their undergraduate education, and in time, people from other departments started to get used to their flexibility in their working environment and dress and appearance norms. Besides people from other departments, academics in their department also do not have any comments about dress and appearance norms. Cultural forms become visible in the undergraduate education of industrial design. They create essential elements of industrial designers' professional culture in their educational life; "being a community, having flexibility in time and space, and working long hours". These aspects are fundamentally interconnected and provide crucial information for the emergence of the professional culture of industrial design in educational life.

Work Experiences of Industrial Designers in Manufacturing Companies

The research explored industrial designers' professional lives to understand how their work experiences in manufacturing companies are influenced by the relationship between their professional and organizational cultures. Manufacturing companies are usually where scientists and engineers have dominant and pivotal roles in advancements (Marinas et al., 2021). Therefore, manufacturing companies' organizational culture tends to contain many aspects of engineering culture. Due to the differences between professional design and engineering cultures, industrial designers need to fit comfortably into the organizations' culture.

Three out of five cultural forms, social relations, language, physical space, and artifacts regarding professional culture on work experiences came forth. Regarding social relations, participants expressed that being a community and having a comfortable and flexible working environment have pivotal roles in their work experiences. Unlike their educational life, where designers work among themselves, participants emphasized their interaction with engineers, who have different mind-sets with different values and priorities. Most participants agree that collaborating with engineers involves different approaches and disagreements. The following account provides an example on the topic by stating:

> *"When we work with engineers, minor differences occur. For a designer, the function is vital; it cannot be separated from the form. For example, while an engineer is working, support must be given to the product for self-standing. If you do not constrain or guide them, engineers cannot do things. Alternatively, if you do not give alternative solutions, the engineer calculates and thinks this is the best solution; let us do this. Why do we choose other options? Then, the engineer offers you a single solution."*

The statement demonstrates that industrial designers prefer to be around and are pleased to work among their peers within their community as they have lived through similar experiences. Additionally, differences in the work dynamics between industrial designers and engineers are the points in which disagreements arise. Industrial designers feel obliged to adopt the professional culture of engineers to fit in the organizational culture or choose to work in designer-dominated work settings such as design firms.

> *"Back there [in the software company], the dominant culture was software engineering. They did not know my profession. Some people said that they had heard of an industrial designer for the first time. I knew I was not involved in that culture and could never be involved."*

Communication appeared as the second issue through which the professional culture becomes visible in work settings. Participants stated that their common language and jargon in education and work life show crucial differences. In their undergraduate education, industrial designers are accustomed to a flexible working environment where they work within their community. That leads to more casual communication and socialization between industrial designers. Because they share similar experiences and perspectives that form a common culture, they seek this feature from their educational experiences in their work lives. Almost all the participants compared their work environment with design studios and stated that there is a very unfamiliar formal working environment. The following account proves that by stating:

> *“The work environment is very formal. I find people more boring at work. It is not like school. So, because it [work environment] is not designer-led, you are not in the same mind-set as others in work.”*

Industrial designers feel strained in a formal work setting where they cannot work with their colleagues in their community. Just like socialization, they find communicating with their colleagues more casual. Since they are accustomed to sharing similar experiences and perspectives that form a common culture in undergraduate education, they seek this feature in their work lives. However, in professional life, their common language changes when working with people from other professions. Companies’ business sectors also differentiate everyday

language by providing special terms and sayings. The account below provides an example on the subject by stating:

> *"For example, while working in [design-oriented company], there was no such thing as, will they understand if I will use that term? Of course, they will understand. We all use the same common language. However, as I said in [manufacturing company], people do not even have to know the point of my job."*

Industrial designers who have professional experience in engineering-oriented manufacturing companies and design-oriented companies state that the different address forms and jargon styles are different. Dominant engineering culture in the manufacturing industry makes changes in communication and common language. In that sense, the account above shows that specialized terminologies, according to their work industries, make changes in their professional jargon.

Physical space and artifacts were used as a fundamental cultural form while defining their work experiences and their relations with professional culture. Community and flexibility aspects of the professional culture have pivotal roles in physical space and artefacts. Industrial designers consider their design studios as their homes in undergraduate education. They compare their design studios and their office spaces in the companies they work for in their work life. In manufacturing companies, industrial designers primarily work in open office layouts. Industrial designers who have experience working both in an open-office layout with people from other professions and in an office entire of designers prefer working within their community because of the traditional professional culture and flexible unwritten rules they share, as the account below shows by stating:

> *"My work environment in [design-oriented company] was more comfortable because the office belonged entirely to us [industrial designers]. In the [manufacturing company], there were cubicles… The cubicle is a rather unfortunate design and a structure that negatively affects the employee's performance."*

According to the interviews, most industrial designers suffer from small workstations in manufacturing companies' offices. Companies are not aware of the requirements of their profession. Since industrial designers work in open offices with other professions, their workstations are primarily suitable for general purposes. While affecting industrial designers' motivation, all these problems also create contrasts between the professional culture they gained in their educational life and their professional experiences. A participant's statement below gives the overall idea of participants on the given subject.

> *"We have a table that looks like it is from the accounting department; it is more like an officer's table. We can make drawings on it at most. It is an environment that should be kept clean and quieter.*

The flexibility aspect of the professional culture also becomes visible when industrial designers' perception of dress and appearance norms is explored. Most participants agreed that these norms stay the same between academic and professional life. One participant compares their dress and appearance norms between academic and professional life as follows:

> *"Usually, you must wear a shirt and a tie [in a manufacturing company], but we do not. There is not much criticism. You need to take care of your beard. Other than that, I have not heard anything regarding dress codes. I wear almost the same things that I wore at university."*

In professional settings, dress and appearance norms are the features that change the least among all the cultural forms. Manufacturing companies that are familiar with the design process and contain design departments that lead to industrial designers' flexible dress codes. While there are formal rules concerning appearance, industrial designers mostly dress almost identically to their academic years. In the interviews, industrial designers revealed their process of becoming industrial designers. With many examples, they demonstrated that their professional culture's foundations were laid from the beginning of their undergraduate education. According to the interviews, three main features create professional culture: 1) being a community, 2) flexibility in space and time, and 3) working for long hours (see Figure 3).

Figure 3. Aspects of professional culture in industrial design education

All these aspects interconnect regularly and link with five cultural forms in professions and organizations: stories, language, social relations, physical space and artifacts, and dress and appearance norms (see Figure 4).

Figure 4. The relationship between cultural forms in educational life and professional life

Stories, language, and social relations are often mentioned in industrial designers' educational and professional lives. Their roles and importance started from the beginning of their education and continued in professional life. In terms of physical space and artifacts, the flexibility aspect of the profession becomes visible. However, its relationship with flexibility and long working hours is still substantial, with examples from design studios. Lastly, dress and appearance norms present insights into the flexibility feature of industrial designers' professional culture.

However, it is the least visible one where professional culture becomes visible among all five cultural forms.

Conclusion

The research, whose problem area, aim, and research questions are based on the literature review, mainly concentrated on the connection between the professional culture of industrial design formed in education and its equivalent within the professional culture in manufacturing companies. The formation of the industrial design professional culture investigated within the scope of the research questions is constructed through a community-based collaborative and flexible setting in design studios. Additionally, the industry collaborations within industrial design education provided students with information about their future profession's context, process, and practice. This information has shaped the professional perceptions of the students in their educational life in an industry-specific way and started to create specializations in their professional culture. Interdisciplinary teamwork and collaborations within the scope of the organizational structures of manufacturing companies and the job descriptions of designers have also diversified the professional culture acquired in education by providing an interdisciplinary approach.

The cultural forms in organizations investigated in the literature review were re-evaluated through the professional culture of industrial designers and their experiences in manufacturing companies. While they all present professional culture in different sorts, stories, and language, the five cultural forms from the literature introduce more subjective perspectives. However, social relations, physical space and artifacts, and dress and appearance norms provided more visible examples of professional culture in organizations. Within the research scope, one main finding is that education and the professional life of industrial designers are interconnected. This finding's effect illustrates two main conclusions, concentrating on the importance of being a community and the importance of having flexibility in space and time.

Importance of Being a Community

Being a community is essential to industrial designers' professional culture. This sense of community is built during their educational life, and they want to sustain it during their professional lives. In professional culture, fostering a strong sense of community is vital. The community nurtures creativity and collaboration, essential traits in the dynamic field of industrial design. Industrial design is a relatively contemporary profession with a lower student number than some other disciplines they work with, such as engineering. This situation creates a robust social bond among students and the emergence of a community. Students spend most of their time experiencing their abstract design education for long hours and learning together by socially interacting within design studios. Lack of a clear path to do their assignments leads them to adopt the trial-and-error system. That enhances social interaction and sustains a well-established community in industrial design education. This social interaction cultivates a strong sense of belonging and identity within the design community, instilling students with purpose and passion as they connect with past designers and feel inspired to contribute to the field's evolution.

In their work, industrial designers wish to work within their community as in their undergraduate education. However, in manufacturing companies, they primarily work collaboratively with more people from other disciplines. This interaction does not match their

initial sense of community and togetherness during their education. Their professional culture differs from other disciplines, such as engineering (Johnson et al., 2009) and the manufacturing companies' organizational culture. These cultural differences cause work adaptation issues for industrial designers. Some industrial designers adapt to this new culture through multidisciplinary collaboration and teamwork and further develop their professional culture. On the other hand, others choose to work in design-led companies or design offices with their colleagues. In conclusion, it was revealed that industrial designers are settled into working with peers in a setting like their educational lives. Acting as a community feature of their professional culture emerges in undergraduate education, and its essence further develops to be a prominent aspect of their professional lives.

As the research question explores, in the context of professional culture, the notion of community is crucial and takes on a multi-dimensional role within industrial design education. It serves as a platform for knowledge, meaning, and value creation and transfer, where ideas are shared, critiqued, and refined in design studios. It provides a support system for students, faculty, and professionals, fostering an environment where individuals feel empowered to take creative risks and push the boundaries of design innovation. Therefore, being a community goes beyond the design studios; it encompasses a network of students, educators, professional individuals, and industry partners where co-creation and collaborative projects thrive.

Importance of Having Flexibility in Time and Space

Industrial design represents an interdisciplinary field wherein designers engage with and collaborate alongside other disciplines like engineering. It is a dynamic profession requiring constant adaptation, as design solutions must harmonize with swiftly evolving technologies, user demands, and societal shifts. In such an environment, rigid frameworks and inflexible approaches can impede creativity. Flexibility in both time and space facilitates the natural flow of ideas, enabling designers to explore, experiment, and refine without limitations. This flexibility empowers individuals to surpass traditional classroom confines, embracing diverse learning contexts that nurture creativity and innovation.

Like being a community, having flexibility in the work environment is also a crucial feature of the industrial designers' professional culture. It is also established in their formal educational lives. As the findings show, industrial designers study for long hours together as a community, primarily within their design studios, which they consider home. Industrial designers socialize, eat, and sleep in design studios besides studying. This physical setting creates a sense of belonging. They need to be in the studios for specific assignments, which shapes their dress and appearance more comfortably. People from other departments started to see the flexible nature of industrial design education, and they became accustomed to this professional culture in undergraduate education. Flexibility in time and space clears obstacles of rigid rules and regulations of time and space; therefore, industrial design education offers a dynamic learning experience and enriches real-world practices.

The findings revealed that industrial designers look for flexibility in their work environment. Unfortunately, manufacturing companies might be unable to provide flexible work settings like design studios. This contrast in the physical setting also leads to a problem of professional adaptation in industrial designers. The level of flexibility changes according to the organizational culture of the companies. Companies that maintain a strong design culture

understand the significance of flexibility in the professional culture of industrial designers. These companies provide work environments that are flexible enough to accommodate the needs of designers. This situation also affects industrial designers' dress and appearance norms in their work-life compared to their education process. While industrial designers in the design departments might be able to dress more freely, departments like management, engineering, or accounting dress more formally.

Therefore, as this study seeks to answer, flexibility in time and space is a critical aspect that shapes the professional culture of the industrial design profession within work life. It fosters a culture of adaptability and resilience within the industrial design profession. Industrial designers who embrace flexibility are better equipped to thrive in this dynamic landscape, leveraging emerging opportunities and easily overcoming unforeseen challenges. Ultimately, flexibility in time and space nurtures a sense of autonomy and empowerment among designers, allowing them to chart their process and practice on their terms.

Implications for Industrial Design Education

This research has addressed the differences between the professional cultures of industrial designers and the organizational cultures of the manufacturing companies they work for. Based on the findings and conclusions of the research, cultural disconnection between industrial designers and manufacturing companies results in miscommunication and misunderstanding, work quality and efficiency issues, and career limitations for industrial designers. Such issues arising indirectly from cultural disconnection can be mitigated by emphasizing the development of soft skills that (1) promote interdisciplinary collaboration and teamwork and (2) emphasize communication skills in industrial design education.

Moreover, creating opportunities for industrial design students to collaborate with manufacturing companies during undergraduate education can more precisely prepare students for professional life. Through engagement in real-world projects alongside industry stakeholders, students acquire first-hand experience addressing the complexities of realizing designs and establishing connections with potential employers. Besides technical expertise, industrial design education should equip students with communication, negotiation, and teamwork skills. These abilities are crucial for nurturing productive collaboration between designers and engineers in manufacturing companies and adeptly navigating cultural disparities in professional environments (Kaygan, 2023).

Limitations and Further Research Directions

Since this research explores industrial designers and manufacturing companies in Turkey, the data focused on designers trained and working in Turkey. Although design education and industry in Turkey share similar trajectories with other developing economies, such as Latin American countries, where industrial design has gone through a similar development as Turkey, and Asian countries where government policies have provided support for the integration of industrial design to industry (Er, 1997), we acknowledge that culture is context dependent. We hope that further research on the professional culture of design that focuses on other national contexts, of both similar at different economic developments, provides us with comparable research outcomes.

Acknowledgments

This article is produced from the MSc thesis entitled “The Relation between the Professional Culture of Industrial Designers and their Experiences in Professional Life” authored by the first author, and supervised by the second author at Middle East Technical University, Graduate School of Natural and Applied Sciences.

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Appendix A

Interview questions

Questions about profession

- How would you describe an industrial designer?
- How would you separate industrial designers from other (creative or not) profession groups?
- Why did you want to be an industrial designer? What were your thoughts about this profession before you started university?
- Have you changed these thoughts since you started university (throughout your education life)? In what direction and how much? Are you pleased to be doing your job right now?

Questions about education

- What do you remember about your undergraduate years? (Positive or negative sides)
- From whom and how did you learn to be a designer in this process? How did the people around you define the designer?
- Were there any terms, phrases, or address forms you often encountered during your undergraduate years?
- What were the most influential stories you heard about your department or profession from students in upper classes or academics?
- Were there any general opinions about how the designer should look in your undergraduate years?
- What about the design studio during your undergraduate years (written / unwritten rules, spatial perception, usage style, rituals)?
- What about your communication with academics and assistants during your undergraduate years? Was there someone you influenced? Why and how?
- Is there anything you can tell that, unlike students from other departments or universities, we did this in the undergraduate years, or did we go there?
- Have you worked with people from other departments during the undergraduate years? If so, what characteristics did you see that were different from yours?
- What do you think about the professional culture that your university impresses on you?
- What do you think about the industrial design departments in other universities? Do you see yourself differently?

Questions about work-life

- What did you do after graduation? (Where did you look for a job? Did you look for a career?)
- What can you say about the organizational culture of organizations or companies you have worked in so far?
- Do you work more individually, or does group work play a more pivotal role in your working environment?
    - Who is on the team? From which universities/departments are these people?
    - Are there any differences between your perspectives and those of others? If so, how? How do they affect your work experience?
- I have just asked you about the professional culture you learned in your undergraduate education. For example, how the designer looks, how he/she speaks, how he/she socializes, and so on. If you consider these in the context of extensive culture of the organization/company that you are working in,
    - What are the terms or address forms that you often use in your working environment, and how do you compare them to those you used in your undergraduate education?
    - What kind of language do you use in your working environment? Familiar or foreign to you?
    - How do you dress at work? Is it different from the undergraduate years? Why and how?
    - What kind of working environment do you have? (Does it resemble the studio environment in the university?)
    - How are your relationships with your colleagues? Is there a social environment? Are there any known social activities primarily organized for your department or organization/company?
    - How is your relationship with your manager? How often do you come together with them on projects? What do you think about the current organizational structure? (hierarchical relations)
- Have you changed your thoughts and opinions about your profession since you started your work life?