Örnek Olay / Case Study

www.yuksekogretim.org

TÜBA-HER Yükseköğretim Dergisi TÜBA Higher Education Research/Review

Metaphors of University-Industry Relations: Interpretations on Technology Development Zones Unveiled

Üniversite-Sanayi İlişkilerinin Metaforları: Teknoloji Geliştirme Bölgeleri Üzerine Yapılan Değerlendirmelerin Yorumlanması

Mehmet Ali Yılık[1], Yaşar Kondakçı[2]

[1]Department of Modern Languages, Middle East Technical University, Ankara, Türkiye
[2]Department of Educational Sciences, Middle East Technical University, Ankara, Türkiye

Özet

Bu çalışmanın amacı, üniversite-sanayi ilişkilerini açıklamada kullanılan metaforları araştırmaktır. Metaforlar, örgüt analizinde elverişli bir nitel araçtır çünkü bir örgütteki katılımcılar tarafından kullanılan metaforları ortaya çıkarmak ve bunları yorumlamak hem araştırmacının katılımcıların gizli algıları ve duygularına ulaşmasına izin verir hem de araştırmacıya üniversite-sanayi ilişkilerinin kilit bir örgütü olan Teknoloji Geliştirme Bölgeleri (TGB) hakkında derinlemesine bilgi sağlar. Bu çoklu örnek olay çalışmasında, iki üniversite ve bir yüksek teknoloji enstitüsü ile bunların ilintili TGB'lerinden gelen 20 katılımcıdan veri toplanmıştır. Bu katılımcılar, üst düzey üniversite yöneticileri, üniversite-sanayi ilişkileri ile yakın ilişkili öğretim üyeleri, üst düzey TGB yöneticileri ve üst düzey TGB şirket yöneticilerinden oluşmaktadır. Veri toplama aracı olarak yarı-yapılandırılmış görüşme soruları kullanılmıştır. Üç örnek olaydan toplanan verinin örnek olay içi ve örnek olaylar arası içerik analizi sonuçlarına göre, katılımcılar üniversite-sanayi ilişkilerini açıklarken üst temalar olan olumlu ve olumsuz metaforlar kullanmışlardır. Olumlu metaforların alt temaları arayüz, makine, barlar sokağı, vitrin ve bitki metaforları olarak listelenebilir; olumsuz metaforların alt temaları ise, zombi, bebek ve emlakçı metaforları olarak sıralanabilir. Katılımcıların bu metaforları betimlemelerinden ve bu metaforları kullanmalarını gerekçelendirmelerinden yola çıkarak, katılımcıların araştırmanın odağında olan üniversite-sanayi işbirliği olgusuna dair değerlendirmeleri üzerine bazı çıkarımlarda bulunulmuştur.

Anahtar sözcükler: Metafor, Teknoloji Geliştirme Bölgeleri, üniversite-sanayi ilişkileri.

Abstract

The purpose of the study is to examine metaphors that are used to explain university-industry relations. Metaphors are a lucrative qualitative tool in organizational analysis because extracting and interpreting metaphors that are used by participants in an organization can not only allow researchers to access hidden perceptions or feelings of the participants but also helps them gain insights about a key organization of university-industry relations: Technology Development Zones (TDZ). In this multiple-case study, 20 participants were involved from two universities and an institute of high technology, and their embedded TDZs in Turkey. Participants are high-rank manager-academics, faculty affiliated with university-industry relations, high-rank managers from TDZs and those of firms inside these TDZs. In order to collect data, semi-structured interviews were used in the study. Results from a content analysis of within-case and cross-case data from the three cases in the study showed that participants use superordinate themes of positive and negative metaphors to explain university industry relations. The positive metaphors superordinate theme involves the metaphors of interface, machine, bars district, showcase, and plants, while the negative metaphors superordinate theme includes zombie, babies, and real-estate metaphors. Based on the participants' descriptions of these metaphors and their justification for their use, some conclusions were made on the participants' evaluations of the university-industry relations phenomenon, which is the focus of the study.

Keywords: Metaphors, Technology Development Zones, university-industry relations.

Knowledge-based economy ideals and, parallel to this, the will to transform current industrialized societies into knowledge societies (Organization for Economic Cooperation and Development [OECD], 1996) have echoed in circles where increased development and welfare of states are set as strategic goals for the 21st century. Dating back to post-World War II (WWII) era, the endeavor to serve best to their citizens and pursue national interests have been the focus of competitive states; thus, this challenging goal sparked competition in science and technology all around the world (Mitchell,

İletişim / Correspondence:
Dr. Mehmet Ali Yılık
Department of Modern Languages, Middle East Technical University, Üniversiteler Mah., Dumlupınar Bulvarı No: 1, 06800, Çankaya, Ankara, Türkiye
e-mail: yilik@metu.edu.tr

Yükseköğretim Dergisi / TÜBA Higher Education Research/Review (TÜBA-HER), *12*(2), 349–362. © 2022 TÜBA
Geliş tarihi / Received: Nisan / April 30, 2020; **Kabul tarihi / Accepted:** Eylül / September 30, 2021
Bu makalenin atıf künyesi / How to cite this article: Yılık, M. A., & Kondakçı, Y. (2022). Metaphors of university-industry relations: Interpretations on technology development zones unveiled. *Yükseköğretim Dergisi*, *12*(2), 349–362. doi:10.2399/yod.21.729919
The study was previously presented at the 3rd INES International Education and Social Sciences Congress in Antalya, Turkey in 2018 with the title "Metaphors of university-industry relations: Interpretations on Technology Development Zones unveiled".

ORCID ID: M. A. Yılık 0000-0002-2586-1670; Y. Kondakçı 0000-0003-2244-7076

1999), giving way to the establishment of partnerships between university and industry in forms of embedded research centers in universities- often motivated, funded and subsidized by the states- or free-enterprise research centers. These centers evolved into what is today known as science and technology parks, or officially as Technology Development Zones (TDZs) in Turkey. Science and technology parks or TDZs are 'interconnection organizations' of the cooperation between university and industry. TDZs are attributed utmost role by nation states to realize the current competition of Industry 4.0 leap into cyber-physical systems for digitization following the Industry 1.0 leap into mechanization with steam power, Industry 2.0 leap into mass production with electricity, and Industry 3.0 leap into automation of production systems with information technologies (Nowotarski & Paslawski, 2017). Furthermore, universities are becoming more entrepreneurial (Etzkowitz, 2003) to engage in a new mode of knowledge and technology production, that of a joint effort with the industry (Gibbons et. al, 1994).

According to statistics by United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2017), there are 85 major science and technology parks in North America and 230 major science and technology parks in Europe; science and technology parks have great importance in a country's development as evidenced by the export of value-added products, services and designs. According to the statistical office of the European Union, EUROSTAT (2019, p. 9), "In 2018, EUR 349 billion worth of high-tech products were exported by the EU, which represented 18 % of all extra-EU exports". In Turkey, however, a cumulative sum of only about 3 billion Euro worth of high technology products were exported by 2018, which represented around 2% of all of Turkey's annual exports (Konak, 2018); the figures demonstrate that even the high technology products that the EU is capable of producing alone accounts for more than double the total export capacity of Turkey (Ministry of Commerce, 2019).

Thus, just as in the world, a new paradigm of entrepreneurial and innovation-driven university and a 4.0 stage industry is championed in Turkey which is rooted in research and development, knowledge and technology production by producing value-added products, services, and designs in mediating organizations of university-industry relations like TDZs. TDZs, however, are emerging organizations with a history of a couple of decades in Turkey. TDZs have previously been researched much from an economic -efficiency- perspective (Guadix, Carrillo-Castrillo, Onieva, & Navascues, 2016; Kayalıdere, 2014; Latorre, Hermoso, & Rubio, 2017; Sevsay, Mıynat, & Aktaş, 2017; Siegel, Westhead, & Wright 2003; Van Geenhuizen & Soetanto, 2008); however, from a higher education perspective, interpretations and experiences of key persons in TDZs and university-industry relations in a rarely used methodological design of multiple-case study and via the organizational tool of metaphors are less researched. In accord with this gap, in order to explore a less researched phenomenon (university-industry relations) with a concentration on its emerging organizations (TDZs) in Turkey via the experiences and interpretations of the key participants, the metaphors that were used by these key participants were extracted and interpreted in this study.

University, Industry and TDZs

Advancements in higher education systems in the West in the 19th century, especially the Humboldtian university model to advance research and meet the increasing demands of Industrial Revolution (Altbach, 2005), necessitated a more synchronous, modern university in earlier Turkish higher education system that is usually associated with the establishment of the Royal Academy of Ottoman era in the 19th century (Erichsen, 1998; Council of Higher Educaiton [CoHE], 2019). Inauguration of a western style university in modern Turkey coincides with the foundation stages of the newly established Turkish Republic in the early 20th century, when new Turkish state's nation-building ideals were also embedded in the higher education system. Turkish higher education, then, has been through many restructuring and expansion waves: spread of universities in Anatolia (non-metropolitan cities) in post-WWII era, 1980s and the establishment of a supreme governmental body -Higher Education Council- and the introduction of foundation universities, 1990s and the establishment of state universities in large scale, 2000s and "one university in every city policy". Recently, Turkish higher education system has involved more than 200 higher education institutions (CoHE, 2019) while quality, mission diversification and research-intense universities, and university-industry relations have become hot topics on the higher education agenda of Turkey.

The introduction of Industrial Revolution brought together sweeping changes in many fields of life such as politics, economy, and education -production systems being maybe the most influenced one. The latest twist, Industry 4.0, is the transition from information technologies for automation into cyber-physical systems into digitization that resulted from a sequence of changes: the Industry 1.0 leap of manpower into steam power for mechanization, Industry 2.0 leap of steam power into electricity for mass production, and Industry 3.0 leap of electricity into information technologies for automation of production systems (Özüdoğru, Ergün, Ammari, & Görener, 2018). In the Turkish context, a late arrival of industrial advancements in the Ottoman era was the case, and new technology and systematic production were sought after due to military concerns. The Modern Turkish Republic displayed an

industrial leap in early 20th century by establishing state-owned enterprises. The Post-WWII era industry in Turkey can be associated with belated mass production, which preceded another belated industrial leap of digitalization of production systems in late 20th century. Meanwhile, the Scientific and Technological Research Council of Turkey (STRCT) and State Planning Agency were established to supplement long awaited industrial leap, which called for an intersection of university and industry to promote Turkish industrial production. Thus, university-industry partnership, commercialization of research, and competitiveness were introduced into industrial and higher education spheres in the late 20th century and in the early 21st century. In addition, knowledge-based economy ideals of the state were embodied in university-industry relations where TDZs have instantly become organizations between university and industry with an emphasis on research and development, innovation, and entrepreneurship.

Emergence of TDZs in the Western world owe much to the post-WWII space race between the USA and Russia (then USSR). Silicon Valley is widely credited to emerge as the first science and technology park or TDZ; expansion of science and technology parks or TDZs into Europe was commonplace in 1970s and 1980s (Mian, Fayolle, & Lamine, 2012; Mian & Hulsink 2009; Vila & Pages, 2008). A science and technology park, as commonly accepted by international organizations such as International Association of Science Parks [IASP] (2019), means:

- *…an organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To enable these goals to be met, a Science Park stimulates and manages the flow of knowledge and technology amongst universities, R and D institutions, companies and markets; it facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and provides other value-added services together with high quality space and facilities.* (para.1)

Bearing similarities to IASP's definition, in the Turkish context, a science and technology park is referred to as a Technology Development Zone by law, which means:

- *…a site where academic, economic and social structures become integrated or a technopark which has these characteristics, where, by benefiting from the opportunities of a particular university or higher technology institute or R and D center or institute, companies using high/advanced technology or companies that aim at new technologies produce/develop technology or software, where the companies work to transform a technological invention into a commercial product, method or service, thus contributing to the development of the zone, which is in the premises or close to the same university, higher technological institute or the R and D center or institute.* (Technology Development Zones Law, 2001, p. 1)

In the aftermath of reforms and restructuring in Turkish higher education in 1980s, coupled with a push to boost industrial production in a time of increased investment in knowledge and technology production, Technology Centers were set up. Then, they paved the way to the establishment of TDZs in Turkey only in the beginning of the 21st century. TDZs were accompanied by a transformation or reconceptualization of knowledge and technology production, and research context. TDZs signaled a new phase in knowledge and technology production, that of a co-production (university and industry) of knowledge and technology to serve the industry and knowledge economy ideals of the Turkish state. According to latest figures by the Ministry of Industry and Technology [MoIT] (2021), there are 89 TDZs in Turkey, 73 of which are operational while 16 are at pre-operational stage; a total of 6967 firms employ 72,399 personnel most of whom work in research and development (RD); and a cumulative sum of 6.3 billion dollars of export volume has been reached cumulatively by TDZs since their establishment.

Metaphor Analysis in Organizations

Origins of the use of metaphors in organizational research can be traced back to 1980s, in Gareth Morgan's "Images of Organizations", where he identified eight metaphors that help generate multiple perspectives on organizations; two leading metaphors were stressed: machine and organism. These two metaphors are believed to limit our understanding of and practice in organizations; therefore, the other six metaphors by Morgan (2006) were also employed by organizational researchers: brain, culture, political system, psychic prison, transformation and flux, and a system of domination. Morgan also welcomes additional metaphors instead of limiting possibilities down to eight as no one or a certain set of metaphors may fully uncover the actual workings of an organization. Palmer and Dunford (1996) contribute to the metaphor literature by emphasizing the dominant machine metaphor, and they also add several others, as suggested by Morgan.

Organization science concentrates on several rationales to use metaphors as a research tool, two prominent ones rest on the descriptive and prescriptive nature of metaphor use. That is, using metaphors in organizational analysis may describe phenomena (Cornelissen, 2005; Şimşek, 1997), and facilitate or provide solutions to organizational problems (Grant & Oswick, 1996). Metaphor use in organizational analysis may also have a generative rationale as suggested by Grant, Hardy, Oswick and Putnam (2004), in which they explain that metaphors may help generate novel points of view, knowledge or insights into organization theory and practice. According to Putnam, Phillips and Chapman (1996) metaphors are tools for building

theory and they also offer members in an organization to portray their organizations.

Another view is that metaphors can be used as a qualitative tool in a descriptive manner to explore organizations (Ertem 2017; Morgan, 2006; Yıldırım & Şimşek, 2016). In short, according to literature on metaphor use in organizational science, organizational researchers can use metaphors as a qualitative research tool for many purposes: describe, prescribe, explore phenomena; facilitate or provide solutions; build theory; or generate new perspectives and knowledge in organization theory and practice. As a result, organizational researchers can develop insights about the organization since an extraction of metaphors used by the participants in a study help reflect their understandings and emotions that they may otherwise be unaware of or hesitant to voice out.

Previous international studies have employed metaphors in organizational analysis in research areas like understanding of organizational image, organizational change, and perceptions and reactions to reform initiatives. To begin with, Cobo, Rocha, Vanti and Schneider (2012) use rather a quantitative approach to analyze organizational metaphors of 198 employees in Brazilian companies via questionnaires, and the results show that the organism metaphor was used the most often while political system and instrument of domination were used the least. Millar and Dickinson (2016), however, prefer a qualitative approach to examine top managers' response to healthcare reform in England via semi-structured interviews. Their findings show that metaphors such as plane, fast food or supermarket are used to depict the challenges and opportunities that come along with the reform in the context of organizational change. Another qualitative contribution comes from Rodrígues and Bélanger (2014) in the form of a case study on managers and primary care providers in Canada; the data were obtained via semi-structured interviews, focus groups and documents to demonstrate their response to primary care reform by using metaphors such as journey, departure, and destination.

Previous studies in Turkey have also employed metaphors in organizational analysis, particularly around research focuses such as organizational change, organizational culture, and other university related themes: research assistantship, and university-academic profession-scientific research. To start with, Şimşek (1997) employs a qualitative design and uses metaphor as a strategy to examine change in higher education context by comparing the metaphors of 24 US university faculty with strategic choices made by their higher education institutions via semi-structured interviews. The findings reveal that metaphors which reflect faculty's description of the organizational change is congruent with the organizational change initiative undertaken by the university. Çelik and Arı (2017) interviewed 67 employees in the banking sector to identify their metaphors for organizational culture. Their findings show that employees mostly use a family metaphor to describe their organization's culture. In regards to university-related themes, Kısa (2013) qualitatively analyzed 47 Turkish university research assistants' use of metaphors through their description of assistantship via a questionnaire with open-ended items. The data revealed apprentice and secretary as the most common metaphors that described their concept of assistantship. Within the context of higher education and research, Yıldız and Gizir (2018) studied metaphors to extract conceptualizations of faculty in a Turkish university in regards to university, being an academic and scientific research. Their results point to three organizational themes: university's structure, function, relationships and communications. It is clear that previous organizational research using metaphor analysis, be it international or national, is qualitative in nature (phenomenology and case study) and concentrates mostly on themes such as organizational image, organizational change, organizational culture and higher education organizations and their constituents. To the best of authors' knowledge, the research employing metaphor analysis in organizational research within the context of university-industry relations or TDZs is rather scarce. Thus, the present study presents a unique contribution to the organizational science literature and metaphor analysis literature by exploring metaphors within the context of university-industry relations with a focus on TDZs. In short, the purpose of the study is to examine metaphors that are used to explain university-industry relations within the context of TDZs. The following research question was developed: How do key participants in university-industry relations perceive and interpret Technology Development Zones?

Method

Research Tradition and Orientation

Today, qualitative research is attributed importance as much as quantitative research (Cohen, Manion, & Morrison, 2011). To start with the definition of the qualitative design in this study - a multiple-case study-, a common definition can be reached from the works of many authors and researchers. A multiple-case study is an in-depth study of multiple aspects of the selected case in many respects to reveal its real-world complexity and unique characteristics (Eisenhardt, 1989; Creswell, 2012; Yin, 2009). A typology of multiple case study includes *(1)* multiple cases with a holistic design and *(2)* multiple cases with an embedded design (Yin, 2009). This study aims to explore and explain the phenomenon of university-industry relations by conducting an embedded design multiple-case study in the context of TDZs. Precisely, the research design in the study rests on within-case writing for each case, replication logic for find-

Table 1. Cases: Universities and their TDZs in in the study.

	University A and its TDZ	University B* and its TDZ	University C and its TDZ
Location	center of Turkey	west of Turkey	south of Turkey
Year of establishment (UNI) / operation (TDZ)	1950s / >10 years	1990s / >10 years	1990s / >10 years
Status (UNI/TDZ)	State / Operational	State / Operational	State / Operational
Degree of establishment[1] (TDZ)	Established	Established	Established
2018 TDZPI[2] rank (band)	1–10	1–10	1–10
2018 EII[3] rank (band)	1–10	1–10	30–40
Number of firms (TDZ)	380+	159	80
Number of personnel (support and RD in TDZ)	8000+	1100	400+
Number of academic personnel (UNI)	2550	525	1732

*Institute of high technology. Data were collected from the official websites of the above organizations in 2019. 1. MoIT's official classification of current TDZs based on year of establishment; >10 years: established TDZs, 5–10 years: developing TDZs, 0–5 years new or pre-operational TDZs. 2. MoIT announces yearly performance of TDZs in Turkey called TDZ Performance Index (TDZPI) based on the parameters of input, operations and output. 3. STRCT announces entrepreneurship and innovation index or performance (EII) of universities yearly based on a set of performance criteria in innovation and entrepreneurship.

ings (Yin, 2009) or cross-case validation of findings (Eisenhardt, 1989), and embedded units of analysis (university administrators, university teaching staff, TDZ administrators and TDZ firm administrators), and use of interviews as the primary source of data collection.

Cases and Participants

The cases in this study are University A and its TDZ, University B* and its TDZ, and University C and its TDZ. The actual names of these universities and their embedded TDZs are coded this way to ensure confidentiality. Table 1 shows descriptive information about these cases.

As shown in Table 1, the cases in this study come from three different geographic regions in Turkey; all are state universities and have operational and established TDZs; all rank in top 10 of TDZ Performance Index or TDZPI. University A and its TDZ seems to be the most established with the most numbers in TDZ firms, number of TDZ personnel and academics. University B and its TDZ seems relatively a newer university with fewer numbers in TDZ firms, number of TDZ personnel and academics. University C and its TDZ seem to perform slightly lower in indexes with even fewer numbers in TDZ firms and number of TDZ personnel, but relatively high number of academics.

The sampling procedure was two-fold: the cases were determined based on a predetermined criterion (Patton, 2002), that is, TDZ Performance Index 1–10 band. In addition, maximum variation was used to foster variation among data sources (Yıldırım & Şimşek, 2016); this study employs four embedded units: key informants selected among university administrators, university teaching staff, TDZ administrators and TDZ firm administrators. Table 2 shows the descriptive information about the key informants that fall into these four categories.

As seen in Table 2, the number of participants is not evenly distributed; however, in each of the four units of analysis at least one participant is present. The participants are mostly

Table 2. Participants in the study.

	University A and its TDZ	University B* and its TDZ	University C and its TDZ
Number of participants	8	7	5
(University administrators,	2 (UNIADM1, UNIADM2)	2 (UNIADM3, UNIADM4)	1 (UNIADM5)
University teaching staff,	2 (UNISTAFF1, UNISTAFF2)	2 (UNISTAFF3, UNISTAFF4)	1 (UNISTAFF5)
TDZ administrators,	2 (TDZADM1, TDZADM2)	2 (TDZADM3, TDZADM4)	1 (TDZADM5)
TDZ firm administrators)	2 (TDZFADM1, TDZFADM2)	1 (TDZFADM3)	2 (TDZFADM4, TDZFADM5)
Gender composition	7 (M), 1 (F)	5 (M), 2 (F)	4 (M), 1 (F)
Age range (mode)	50+	40+	25–45
Range of experience in university-industry relations (mode)	5–10 years and 10+ years	1–3 years and 10+ years	5–10 years

*Institute of high technology.

males with an age range from 25 years to 50+ years, University A and its TDZ having the most senior participants in regards to age and year range of experience in university-industry relations. The participants were coded with abbreviations UNIADM, UNISTAFF, TDZADM, TDZFADM and numbered to maintain their confidentiality.

Data Collection Tools and Procedures

Semi-structured interviewing was used as the main method of data collection as it gives room for adaptation of questions throughout the data collection process; this is also in line with the developmental nature of qualitative research. The interview questions were reviewed at pilot stage by professionals in the fields of Educational Administration, and Science and Technology Policy prior to implementation. The interview questions were both descriptive and prescriptive in nature; that is, the participants not only described how they viewed university-industry relations but they also prescribed how university-industry relations should be by referring to limitations and suggestions in their choice and description of metaphors of university-industry relations. The interview questions (that also had probes for further inquiry) were:

- In your opinion, what metaphor or metaphors can best explain TDZs in the context of university-industry relations?
- Why do you use this metaphor/these metaphors?

Upon obtaining ethics approval, came the implementation of the final data tool that included a demographics section and the interview questions with probes. The interviews were conducted on-site in the offices of the participants where they were explained the purpose of the study; their consent was taken and the interviews were recorded; in some cases where the participant did not consent to recording the interview, detailed notes were taken.

Data Analysis

The recorded interviews were transcribed verbatim; the participants were sent the transcriptions of their interviews to check and approve their answers. Then, content analysis technique was used (Yin, 2009) to draw patterns from mass volume of data that came from a within-case and cross-case analyses of the interview transcriptions on MAXQDA software. A code list based on literature and suggestions by professionals in the fields of Educational Administration, and Science and Technology Policy at pilot stage was modified as participants used unique metaphors and as more codes emerged. The codes were converged under themes (within-case analysis stage) and then under superordinate themes (cross-case analysis stage).

Validity-Reliability

Multiple-case design has validity in that some credibility measures were taken to achieve transferability or analytical generalizability of findings. As for reliability, dependability and confirmability of the findings were maintained (Lincoln & Guba, 1985). To be specific, in each one of the three cases the same data collection tool was used to arrive at parallel accumulation of data that rendered it possible to collect comparable experiences and interpretations on behalf of the participants. As a result, data were primarily organized to extract similarities and differences among all three cases to be able to proceed with data analysis and interpretation of findings. In other words, in line with the very nature of multiple-case study design, the data were collected to enable within-case and cross-case analyses. In short, the validity and reliability measures in the study were audit trail/case study protocol, peer review, debriefing or external audit, rich and thick descriptions, member (informant) check of findings and interpretations, direct quotations, and the code list.

Results

Within Case Findings

University A and its Technopark

The participants used metaphors to reveal how they interpret the phenomenon of university-industry relations (Table 3). Almost all the participants used the metaphor 'interface' to locate technoparks between university and industry as a mediator of the relationship between the two, signaling that they attribute such a central and mediating role to universities and industry.

A university administrator and two TDZ administrators expressed an "interface" metaphor for TDZs:

- *Turning an idea into a project or product ... It's beneficial in that respect, as I said at the university, we do not have anything like producing a prototype with our own means, using technical personnel, putting that idea in the production chains and marketing it.*

Table 3. Participants' metaphors use.

Cases	University A and its TDZ	University B and its TDZ	University C and its TDZ
Metaphors	Interface, machine, bars district, showcase, zombie, real-estate	Interface, showcase, plant, babies, real-estate	Interface, real-estate

We, as a university, produce ideas; technopark [TDZ] is also an intermediary in completing this product. -UNIADM2-

- *Where's hi-tech? At the university. Well, it's at the university but at the university, at the level of research with more theoretical knowledge; technopolises [TDZs] remain a bit practical; the idea is to turn theoretical knowledge into practice or to the industry. Since it is the purpose of the establishment of technoparks, this already exists in the heart of technoparks; there is industry cooperation. The condition of establishing technoparks is already in the law. There has to be a university or a public research center.* -TDZADM1-
- *The structure in our country is based on the support of university-industry cooperation mainly due to the TDZ Law…. The definition of TDZ in the law directs us to university-industry cooperation. Our primary priority seems to be university industry cooperation in the law. Both in our strategic plan and in our design.* -TDZADM2-

A university staff preferred a "machine" metaphor, explaining that in university industry relations there used to be a missing party just like a missing wheel part of a machine in factories; thus, university and industry can now work more systematically and productively.

- *The students benefit a lot; [university-industry togetherness] creates a space to work. Since a lot of companies are together, they are producing things to each other; they complement each other. [TDZs] are a big contributor to the university. The university contributes to them. The wheel must turn somehow; the missing piece was the technopark of the wheel. It has to work like a factory because students and academics need to produce in line with the R and D done there. What's learned there is coming to the university. There's a two-way interaction. Unfortunately, military companies such as ASELSAN and HAVELSAN work unidirectional. What is produced must be shared and spread, and there is not much out there in military projects. At least technopark (TDZ) is in the university, so it's easier to interact with the inside and outside of the campus.* -UNISTAFF 1-

A university staff preferred a "bars district" metaphor, and further elaborated that technopark firms can co-exist with others in a locale; they can both support each other and grow together:

- *My metaphor here would be…you know if there is a single pub or a restaurant on a street that would not be an attraction site…However, if many pubs or restaurants accumulate on a street, then, that street becomes an attraction- they can both compete and support each other due to this togetherness. Technoparks have a similar structure; that firms accumulate on a spot creates synergy and momentum. Technoparks [in Turkey] are like miniatures of Silicon Valley.* -UNISTAFF2-

A university administrator preferred a "showcase" metaphor, and further commented that in the eyes of the governmental bodies, university-industry relations are representative of a country's production, and also that TDZs are tangible organizations to display such capacity to visitors from abroad.

- *We have a very close relationship with our technopark [TDZ], our university, the Ministry of Economy, the Ministry of Industry and Technology, the Ministry of Development, and the Ministry of Finance. Again, each of them sees ours, X's [TDZ] and Y's [TDZ] as something, that is, interlocutors, as part of the economy, as an expert or as a showcase. For example, foreign delegations from the Ministry of Science, Industry and Technology are coming to us. They want to show this place.* -UNIADM1-

A university staff used another metaphor and likened dysfunctional technoparks to "zombies" and explained that those dysfunctional technoparks are organically operational, but they have no real research and development output- they only enjoy tax waivers and funds granted by the state:

- *Most technoparks [TDZs] are zombie technoparks to me. There is an organic activity/mobility within a living technopark but this is not like the one in a healthy person; we can call it a technopark wandering around like a zombie because there is not enough human capital to do business within the dynamics of a technopark nor a developed industry located in that region. I know a few technoparks. They say that we have opened a place in that technopark so that we get tax exemption from there, but our main operation is here [outside the technopark].* - UNISTAFF2-

A TDZ firm administrator staff was critical and used a metaphor "real estate" and explained that unlike the initial intention underlying university-industry relations, TDZs are run by administrations that treat the whole configuration as a real estate agency; thus, aiming at recruiting more firms on campus TDZ sites disregarding their R and D capacity.

- *Do technoparks [TDZs] work like real estate companies or do they really do business? This is questionable. Companies are here for R and D projects, they are here to produce something ... Technopark management should question this. I know that this TDZ is applying it very strictly, while others are in the mood of compromising first, taking the company in, and then trying to tackle the issue.* -TDZFADM2-

University B and its Technopark

In the second case, participants articulated different metaphors to describe TDZs within the context of university-industry relations. In this case, nearly all the participants used the metaphor 'interface' to show the linkages between university and industry; in their descriptions and explanations TDZs act as the connecting device between the university-industry relations.

- *You need a structure that will transform the knowledge you produce here into industry.* -UNIADM3-
- *The industry does not know that academics are doing something valuable; industry is doing something that the university is not*

aware of. Technoparks need to act as intermediaries in order to carry the problems in the industry to the university to look for solutions. They should work like an interface; technoparks should organize events and bring them together. Technoparks have to launch the works done here to the industry. -UNISTAFF3-

- *Technopark is a must. Considering that the university and industry speak different languages, there should be a bridge between them. Technoparks are also important in that respect.* -UNISTAFF4-
- *An academic may not know which industrial organization or product his work can evolve into; he/she does not know this actually. An industrialist may not know which academic works in his/her field of interest. The field of interest of academics is not given in detail on the Internet; industrialists do not understand scientific articles. In this sense, there is an industrialist in need, on the other side, there is an academic who can transfer his/her knowledge and works to the industry; technoparks and TTOs [Technology Transfer Offices] are organizations that will establish the interconnection between them.* -TDZADM3-
- *Technoparks [TDZ] actually form a kind of interface in the production of knowledge and technology. When we talk about cooperation with industry, these technoparks have become a structure that brought the industry closer to the university.* -TDZFADM3-

A TDZ administrator favored another metaphor and said that technoparks are the "showcase" of universities, elaborating on the idea that university-industry relations necessitated competing with other TDZs and universities internationally; TDZs and universities become the showcase or best representation of a country's high-tech production.

- *Technoparks have become the showcase of the technology actually produced in Turkey. The state also endeavors to explain the products and services in technoparks. The state enacted the technopark [TDZ] law. And then, technoparks were established. Therefore, the outputs of technoparks are on the agenda in a way that they can compete not only within the country but also abroad; technoparks are very critical and strategic in this respect. It serves as a kind of showcase for the country; they also receive remarkable media coverage.* -TDZADM3-

A technopark administrator used an agricultural metaphor: university-industry relation is like growing a "plant" where the ultimate aim is to harvest fruit; higher education is the soil and technoparks are the other ingredients such as fertilizers for the plant.

- *Higher education…, there is human capital to produce knowledge, once knowledge is produced there, fruit is also produced; technopark [TDZ] maybe in the role of grafting the plant. Higher education is the soil of this production; technoparks are the seed, fertilizer or water of the plant. Without higher education it is impossible to have technological output. Its role, in the form of knowledge-producing universities, needs to be reconstructed with a strategy that will reach the economy and society. "So I did research; I left it on the shelf" or "I did research, I got the patent, I wrote the publication, I wrote it in my CV"- this does not mean anything. These should now be outputs that return to the society.* -TDZADM4-

A university staff used a metaphor and said that technoparks in Turkey were still "babies", explaining that technoparks in Turkey were still at early developmental stages compared to international examples that date back to 1950s in the US and 1970s in Europe.

- *Technoparks [TDZs] are still babies. They need more time and staff to have a more functional relationship with the university. For example, our graduates work in technoparks; graduates of the faculty of science and engineering should work here. These graduates know technology, but maybe they do not want to be academics. If they can bring this knowledge to the market in the technopark, functionality will increase because trained personnel are important. A friend from TTO [Technology Transfer Office], for example, went to England and told me that there people who are knowledgeable in the field and with PhD work in the TTO.* -UNISTAFF4-

A technopark firm administrator used a "real-estate" metaphor and criticized the high rents on TDZ sites as compared to those prestigious downtown business centers where rents are actually lower with more space.

- *We are now renting here, and believe me, I do not know if you know this city, but there were advertisements in the downtown of new business centers/skyscrapers... With the rent we pay here, we can rent a whole floor in these downtown business centers; technopark is also a source of income for the university.* -TDZFADM3-

University C and its Technopark

The participants in the third case view university-industry relations very much in the same way with other cases in that they frequently describe this relationship with the metaphor "interface".

- *More innovation-oriented technoparks is needed; the university has education mission as well as research mission and public service mission. However, technoparks have a major role in finding products that will be built on top of that basic research, which will be of use and added value, and that will emerge as a result of applied research. Universities cannot do this, so it is difficult to think of universities without technoparks and technoparks without universities. Technoparks are an important pillar or interface that connects the university to industry.* -UNIADM5-
- *We produce something, especially in the engineering faculty, of course, in medicine or other departments there is considerable production, but what we do is directly related to technology and indus-*

try. However, there is a commercial dimension to turn it into a product, patent it, and make it available to the international market. We cannot do it as a state officer. Therefore, technoparks are the first step or an interface for making what we do become concrete. -UNISTAFF5-

A technopark firm administrator complained that university administration does not control technopark administration much and acts like a "real-estate" that is only collecting rent from the technopark, commenting on an inherit criticism that real-estates are considered much profit-oriented and care less about firms or production.

- *The management is less involved; they have the attitude "I'm supplying firms with electricity, water, roads, infrastructure etc." The management see technopark more like a physical building from the eyes of a real estate, I mean... In technoparks [TDZs] we pay rent. Here firms with substantial R and D engagement and products should not pay rent. Instead of taking the rent from firms that came here to produce, tell them that "You will not pay rent, but you will produce this many useful models or that many patents per year." The university management consider university-industry relations a bit commercial; so is the approach ...* - TDZFADM4-

Summary of Within-Case Results

In University A and its TDZ, some welcoming metaphors as to university-industry relations can be obtained from the data: interface of university-industry relations; machine part or a key unit in factory production (high tech production), bars district referring to togetherness of firms in technoparks, and international showcase of country's production capacity; however, some critical metaphors are also present in the data: zombie technoparks or zombie firms that are alive on paper but are neither operational on technopark campus nor do they really produce something as well as the real estate metaphor that refers to a for-profit approach to university-industry relations making high tech production or R and D of firms secondary. In University B and its TDZ, some participants positively approached university-industry relations with their pick of metaphors such as interface of university-industry relations, showcase of Turkey in the national and international markets, and a plant growing fruits (value added products and services); these metaphors all give a positive image of university-industry relations; however, some participants negatively approached university-industry relations and used metaphors such as baby TDZs that are still at early developmental stages and lack human capital as well as a real estate metaphor that corresponds to favoring rent collection from firms over existential function of technoparks- do R and D and produce value-added products, services and designs. In University C and its TDZ, some optimistic metaphors can be observed from the data such as the interface of university-industry relations; however, some pessimistic metaphors are also articulated such as the real-estate referring to university's collecting rents but not involving much into TDZ other than some infrastructural matters, regulations or maintenance.

Cross Case Findings

Positive Metaphors

The data from the interviews reveal that participants use some positive metaphors to explain university industry relations. The participants commonly use the 'interface' metaphor to refer to technoparks. This shows that they position technoparks in the center of all university-industry interactions. Similar to the 'interface' metaphor is the 'machine' metaphor that attributes TDZs a key role like a key machine part in big factory production lines. 'Bars district' metaphor refers to togetherness of firms in a locale to create synergy and produce value-added products or services rather than operating in isolation in different parts of the city. Another metaphor is the 'showcase'; technoparks are seen as contributors to country's image just as a showcase is representative of a shop from outside. Another is an agricultural metaphor of 'plants' in which the aim is to grow a fruit: higher education is the soil and technoparks are the sum of fertilizer and other ingredients like water for the plant.

Negative Metaphors

The data from the interviews reveal that the participants also use some negative metaphors to explain university industry relations. The 'zombie' metaphor refers to TDZs or TDZ firms that are organically (legally) alive but do not produce value added products or services but drain resources (funds, tax waivers etc.) allocated for university-industry relations. The metaphor that TDZs in Turkey are 'babies' implies that they are still not much functional and lack a critical mass of production compared to pioneering examples of technoparks worldwide like Silicon Valley. A 'real-estate' metaphor refers to the general understanding about universities and technoparks (TDZs) that they only collect rent from TDZ firms just like any landlord would collect from the firms in downtown, claiming that technoparks' real mission to produce value added products and services is being undermined or disregarded.

Summary of Cross-Case Results

Some positive metaphors are used to explain university industry relations. Through the participants' description of the positive metaphors (interface, machine, bars district, showcase, an agricultural metaphor of plants) and the negative metaphors (zombies, babies, real estate) it is possible to draw some conclu-

sions and make some suggestions out of participants' interpretation of the phenomenon under investigation: university-industry relations (Table 4).

Discussion and Conclusion

The aim of the study is to examine metaphors that explain university-industry relations within the context of TDZs through the lenses of 20 key participants from top performing universities and TDZs. From a higher education perspective, the study employs a multiple-case study design to develop insights into the interpretations of key informants of university-industry relations, and aims to give an account of implications.

Findings demonstrate that the participants use some positive metaphors to explain university industry relations. Thus, through the participants' description and prescription of these positive metaphors in this study, it is likely to draw some conclusions and provide implications in regards to higher education and university-industry relations. Key informants' perspectives on university-industry relations seem deeply rooted in their descriptions of metaphors and prescriptions as to how these metaphors help better understand and facilitate or provide solutions to university-industry relations. In accord with the descriptive (Cornelissen, 2005; Şimşek, 1997) and prescriptive (Grant & Oswick, 1996) nature of metaphor analysis in organizational science, this study supports the existing literature in that the findings are congruent with Morgan's (2006, p. 338) 'machine' classification of organizational metaphors; Morgan warns that although no single metaphor gives organizational researchers a full picture or an "all-purpose point of view", metaphors "create ways of seeing and shaping organizational life"; in other words, as Bolman and Deal (2003) suggest, their structural frame or metaphors (machine or factory) reflecting that frame may act as different lenses to develop insight into organizations, diagnose problems and apply interventions. In this study, when metaphors of university-industry relations are concerned, participants' metaphors converge around the "interface' metaphor and a closely linked 'machine" metaphor as they outnumber other metaphors both in number and frequency. This signals that participants attribute key importance to university-industry relations and view TDZs a key mediator of this relationship just like an indispensable machine part in a factory line. In other words, TDZs have a central role in university-industry interactions in the lenses of the participants. However, as Morgan (2006) suggests, this also points to the idea that the underlying organizational beliefs of participants may be congruent with a mechanic view of organizations involved in university-industry relations; the interface or machine metaphor is, thus, representative of an archaic approach to organizations on behalf of many participants: Bureaucratic Organizations, Classical Management Theory or Scientific Management Theory.

Some unique positive metaphors of university-industry relations have also been unveiled in this study. As a mid-frequency positive metaphor, the 'showcase' means that technoparks are viewed as organizations that advance a country's image in markets inside and outside Turkey just as a showcase of a store displays the best products or services, and thus is representative of a shop from outside. TDZs attract foreign investment and the number of foreign partnered or foreign capital firms in the TDZs in Turkey has reached 339 in 2021, increasing up to 5% of all companies (MoIT, 2021). In addition, the degree of involvement in university-industry relations has also been an integral part of international rankings recently, which is becoming increasingly important for higher

Table 4. Metaphor descriptions and frequencies associated with university-industry relations and TDZs.

	Metaphor	Explanation	Frequency
Positive metaphors	Interface	TDZs: an intersection organization of university and industry	High (14)
	Machine	key machine part in co-production of university-industry relations	Low (1)
	Bars district	a luring complex with many TDZ firms	Low (1)
	Showcase	TDZs: best exemplars for value-added products, services and design of a country for international markets	Mid (2)
	Plant	TDZs: key party in the production cycle of a fruit -value-added products, services and designs	Low (1)
Negative metaphors	Zombies	TDZs or firms lawfully existent but practically inefficient	Low (1)
	Babies	TDZs still at early developmental stage compared to world examples	Low (1)
	Real-estate	Main income of universities and TDZ administration based on revenue from renting on-campus offices to TDZ firms	Mid (3)

education institutions. For example, one of the commonly cited ranking organizations, Times Higher Education [THE] (2019) reports that in the methodology of rankings industry income or knowledge transfer is part of the criteria. Thus, being a showcase of a country's high-tech production and an indicator of knowledge society, TDZs have been cited as the showcase of university-industry relations by the participants.

'Bars district' is another positive metaphor to refer to the togetherness of firms in a locale to create synergy and produce value-added products or services rather than operating in isolation in different parts of the city. There exist plenty of studies that compared firms in TDZs and those outside the site; some (Löfsten & Lindelöf, 2002; Yang, Motohashi, & Chen, 2009) explored the efficiency of location that provides evidence for the presence of firms in TDZs for increased efficiency and some others (Felsenstein, 1994; Siegel et al., 2003; Westhead, 1997) give negative evidence for the presence of firms in TDZs for increased efficiency. This particular study provides evidence for the literature that supports the argument that the presence of firms in TDZs leads to increased efficiency by this 'bars district' metaphor.

An agricultural metaphor of 'plants' is also a positive metaphor; the aim is stated to grow a fruit in which higher education is the soil and technoparks are the fertilizer for the plant. The plant metaphor may relate to Morgan's (2006) organism metaphor that emphasizes the "individual and organizational needs"; environment is a critical factor for the organism. Considering the organizational needs and the environment in which organizations of university-industry relations operate, a relevant ecosystem metaphor has been frequently cited in macro-level policy documents and publications by the Turkish state. For example, one of the objectives in Eleventh Development Plan (2019) is to strengthen the R and D and innovation ecosystem in which TDZs are an integral part of this ecosystem (İnam, Bal, & Bahçeci, 2019). The use of a 'plant' metaphor is congruent with a macro metaphor of 'ecosystem' in policy documents, where higher education provides the soil- infrastructure, physical site, human capital etc.- and TDZs graft or provide fertilizers or other necessary ingredients; thus, they accelerate the transformation of pure research into high- value added products, services and designs via R and D. The ultimate aim in the use of this plant metaphor would be creating the knowledge economy and the knowledge society, as prompted by OECD (1996), by transforming higher education and the industry via intermediary organizations such as TDZs, R and D Centers, design centers etc.

The findings also show that the participants are quite critical about university-industry relations and its mediating organization- TDZs. Accordingly, they use some negative metaphors to explain their skeptical views on university industry relations. Through the participants' description of these negative metaphors it is likely to draw some conclusions. Some unique negative metaphors of university-industry relations have also been unveiled in this study. A striking negative metaphor is the 'zombie' metaphor that refers to technoparks [TDZs] or firms that are organically (legally) alive but do not produce value added products or services but drain resources (funds, tax waivers, etc.) allocated for university-industry relations. This may be partly due to some failing numbers or abusive attitude of TDZ firms towards university-industry relations; TDZs so far have produced a cumulative sum of 6.3 billion dollars in foreign export of Turkey (MoIT, 2021), and it roughly corresponds to 3.5% of all foreign export of Turkey in 2019 and 3.7% in 2020 (Turkish Statistics Institute, 2020). According to Gür, Çelik and Yurdakul (2019), the number of patent applications may be another indicator in that Turkey has 8196 patent applications in 2017 as compared to 61,474 in Germany and 452,553 in the US. The figures demonstrate that most TDZs in Turkey are likely to be zombie TDZs benefitting from tax waivers or state funds but not achieving the expected success despite much investment within the last two decades.

Another negative metaphor is 'babies' implying that TDZs are still not much developed and functional, and also they lack a critical mass of human capital and production capacity compared to the pioneering examples of technoparks (TDZs) worldwide. TDZs in Turkey have a relatively new history compared with the emergence of TDZ examples in the US and those examples in Europe (Mian, Fayolle, & Lamine, 2012; Mian & Hulsink 2009; Vila & Pages, 2008). TDZ Law (2001) enabled the establishment of TDZs only in 2001 as opposed to the establishment of TDZs in 1950s in the US and in 1970s in Europe. This gap of emergence or development is evident in MoIT's classification of TDZs in Turkey: developed TDZ with 10 or more years of establishment; developing TDZs between 5–10 years of establishment; and newly opened or pre-operational TDZs with 0–5 years of establishment. The participants also point to a need for 50–60 more years so that Turkish TDZs may become more established and can compete with their international counterparts. Another concern raised by the participants is the need for more human capital and production capacity that is central for the development of TDZs in Turkey. The figures confirm this need since the number of R and D personnel per million in France -with roughly the same population as Turkey- was four times higher than that of Turkey in 2016 according to Gür, Çelik and Yurdakul (2019).

'Real-estate' is another mid-frequency negative metaphor; this criticism refers to the idea that universities and technoparks only collect rent from TDZ firms just like any landlord would collect from firms in downtown, implying that technoparks' real mission to produce value added products and services is being undermined or disregarded. The data from open access sources demonstrate that the average rent in TDZs per square meter is around 20 US dollars for top performing TDZs in metropolitan cities, and 20 Turkish liras in other non-metropolitan TDZs. This is the source of criticism by the participants (mostly TDZ firm administrators) that while it means income for the university, it is becoming less and less payable for the firms. These firms also state a lack of services in return for the high rent collected by the university. However, as in the example of an eastern TDZ in Turkey, there are rent waivers for TDZ firms that truly involve in scholarly publication, and produce value added products and services.

This study contributes to organizational science in that it is possibly the first systematic multiple-case study of the patterns and meanings of metaphors within the context of Turkish university-industry relations and TDZs. The findings reveal that positive metaphors ("interface, machine, showcase, bars district, plant") not only outnumber negative metaphors but also they are more frequent in the data; this shows that the majority of the key participants in university-industry relations place much value on and are optimistic about the phenomenon of university-industry relations and one of its key organizations-TDZs- as knowledge-based economy ideals of the state (OECD, 1996), Industry 4.0 (Nowotarski & Paslawski, 2017), entrepreneurial university (Etzkowitz, 2003) and new mode of knowledge production (Gibbons et al., 1994) increasingly become substantial part of the current landscape of the research on higher education and university-industry relations.

However, the presence of negative metaphors in the findings point to some implications for the future of the relationship between university and the industry and its organization in focus in this study: TDZs. To start with, the "zombie" metaphor indicates that the TDZs in Turkey are becoming more resource-draining than being truly productive. A recent initiative by the CoHE in Turkey designated 10 top performing Turkish universities as research universities and allowed them to benefit more funds, investment and personnel. Similarly, 10 privileged TDZs can be designated to benefit from more funds and human capital to reach the expected outcomes in high-tech production; this may help reach knowledge economy and knowledge society ideals sooner than expected. These 10 privileged TDZs may be designated based on the criteria of economic development, geographical distribution, TDZPI, EII, and such. Qualifying to enter this privileged league of TDZs may be lucrative; the counter scenario would be the closure of the zombie TDZs if they continue to drain resources allocated for knowledge economy ideals of the state. Secondly, "babies" metaphor highlights that more time and accumulation of a critical mass -human capital and production volume- is needed for the evolution and development of TDZs; to accelerate this accumulation, luring more international investment or firms, and creating more human capital -RD personnel and PhD graduates- would be a good start. Lastly, the "real estate" metaphor points to another barrier in progress to achieving truly functional TDZs. Operating a TDZ firm seems costly in regards to high rents; project or patent-based rent waiver, an independent TDZ administrative firm, or off-campus low-rent satellite TDZ sites would be some of the solutions. As for the limitations of the study, future studies may include top performing foundation universities and their embedded TDZs since their context may lead to other unique metaphors of university-industry relations. Future research may involve more units of analysis by including employees in TDZs and students interested in university-industry relations. Lastly, the generalizability of the findings in this study is limited to the generalizability of experiences and interpretations despite evidence from cross-case analyses (Eisenhardt, 1989) and replication logic (Yin, 2009) propositions of qualitative inquiry. Thus, a mixed-method study with more participants may increase the generalizability of the findings.

Yazar Katkıları / Author Contributions: Her iki yazar da bu çalışmanın her aşamasında ortak katkı sunmuştur. / *Both authors commonly participated in all steps of this work.*

Fon Desteği / Funding: Bu çalışma herhangi bir resmi, ticari ya da kar amacı gütmeyen organizasyondan fon desteği almamıştır. / *This work did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.*

Etik Standartlara Uygunluk / Compliance with Ethical Standards: Yazarlar bu makalede araştırma ve yayın etiğine bağlı kalındığını, Kişisel Verilerin Korunması Kanunu'na ve fikir ve sanat eserleri için geçerli telif hakları düzenlemelerine uyulduğunu ve herhangi bir çıkar çakışması bulunmadığını belirtmiştir. / *The authors stated that the standards regarding research and publication ethics, the Personal Data Protection Law and the copyright regulations applicable to intellectual and artistic works are complied with and there is no conflict of interest.*

References

Altbach, P. G. (2005). Patterns in higher education development. In P. G. Altbach, P. J., R. O., Berdahl, & P. J. Gumport (Eds.), *American higher education in the twenty-first century: Social, political, and economic challenges* (2nd ed.) (pp. 15–37). Baltimore, MD: The John Hopkins University Press.

Bolman, L. G., & Deal, T. E. (2003). *Reframing organizations: Artistry, choice, and leadership.* San Francisco, CA: Jossey-Bass.

Cobo, A., Rocha, R., Vanti, A. A., & Schneider, G. (2012). Fuzzy clustering: Application on organizational metaphors in Brazilian companies.

JISTEM - Journal of Information Systems and Technology Management, *9*(2), 197–212.

CoHE (2019). *Higher education system in Turkey.* [Article in Turkish] Retrieved from https://www.yok.gov.tr/Documents/Yayinlar/Yayinlarimiz/2019/Higher_Education_in_Turkey_019_tr.pdf (December 9, 2019).

Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education*. New York, NY: Routledge.

Cornelissen, J. P. (2005). Beyond compare: Metaphor in organization theory. *Academy of Management Review*, *30*(4), 751–764.

Creswell, J. W. (2012). *Qualitative inquiry and research design: Choosing among five approaches.* Los Angeles, CA: Sage.

Çelik, T., & Arı, G. S. (2017). Metaphor analysis as an alternative method for determining organizational culture in banks. [Article in Turkish] *Eskişehir Osmangazi Üniversitesi İktisadi ve İdari Bilimler Dergisi*, *12*(1), 31–64.

Eisenhardt, K. (1989). Building theories from case study research. *The Academy of Management Review*, *14*(4), 532–550.

Eleventh Development Plan (2019). *Strengthening the R&D and innovation ecosystems.* [Article in Turkish] Retrieved from http://onbirinciplan.gov.tr/oik-ve-calisma-grubu-listeleri/ar-ge-ve-yenilikekosisteminin-guclendirilmesi/ (December 11, 2019).

Erichsen, R. (1998). Scientific research and science policy in Turkey. *Cahiers d'Etudes sur la Méditerranée Orientale et le monde Turco-Iranien*, *25*, 1–21.

Ertem, M. (2017). Metaphors in the field of management and organization. [Article in Turkish] *International Journal of Academic Value Studies*, *3*(9), 209–220.

Etzkowitz, H. (2003). Research groups as 'quasi-firms': The invention of the entrepreneurial university. *Research Policy*, *32*(1), 109–121.

EUROSTAT (2019). *High-tech statistics – economic data.* Retrieved from https://ec.europa.eu/eurostat/statistics-explained/pdfscache/46748.pdf (December 2, 2019).

Felsenstein, D. (1994). University-related science parks – 'seedbeds' or 'enclaves' of innovation? *Technovation*, *14*(2), 93–110.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies.* Los Angeles, CA: Sage.

Grant, D., & Oswick, C. (1996). Introduction: Getting the measure of metaphors. In D. Grant, & C. Oswick (Eds.), *Metaphor and organizations* (pp. 1–20). London: Sage.

Grant, D., Hardy, C., Oswick, C., & Putnam, L. (Eds.). (2004). Introduction. Organizational discourse: Exploring the field. In D. Grant, C. Hardy, C. Oswick, & L. Putnam (Eds.), *The Sage handbook of organizational discourse* (pp. 1–36). London: Sage.

Guadix, J., Carrillo-Castrillo, J., Onieva, L., & Navascues, J. (2016). Success variables in science and technology parks. *Journal of Business Research*, *69*(11), 4870–4875.

Gür, B. S., Çelik, Z. & Yurdakul, S. (2019). *Higher education at a glance - 2019: Analysis and evaluation report.* [Report in Turkish] Ankara: Eğitim-Bir-Sen Stratejik Araştırmalar Merkezi.

IASP (2019). *Definitions.* Retrieved from https://www.iasp.ws/ourindustry/definitions (December 10, 2019).

İnam, İ., Bal, H., & Bahçeci, A (2019). *A model towards state-university-industry cooperation policies.* [Article in Turkish] Anahtar, 24(369), Retrieved from https://anahtar.sanayi.gov.tr/tr/news/kamu universite sanayi-isbirligi-politikalarina-yonelikbir-model-onerisi/9919 (December 15, 2019).

Kayalıdere, G. (2014). The importance of technoparks within technology policy of Turkey and tax advantages for technoparks. [Article in Turkish] *Gazi Üniversitesi Sosyal Bilimler Dergisi*, *1*(1), 75–96.

Kısa, N. (2013). Metaphorical images of research assistants: Who are they? Who they should be? [Article in Turkish] *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, *28*, 47–46.

Konak, A. (2018). The effect of product export of high technology on export volume and economic growth; selected OECD countries and the case of Turkey. [Article in Turkish] *Yönetim Ekonomi Edebiyat İslami ve Politik Bilimler Dergisi*, *3*(2), 56–80.

Latorre, M. P., Hermoso, R., & Rubio, M. A. (2017). A novel network-based analysis to measure efficiency in science and technology parks: The ISA framework approach. *The Journal of Technology Transfer*, *42*(6), 1255–1275.

Lincoln, Y., & Guba, E. G. (1985). *Naturalistic inquiry.* Beverly Hills, CA: Sage.

Löfsten, H., & Lindelöf, P. (2002). Science Parks and the growth of new technology-based firms academic-industry links, innovation and markets. *Research Policy*, *31*(6), 859–876.

Mian, S., Fayolle, A., & Lamine, (2012). Building sustainable regional platforms for incubating science and technology businesses: Evidence from US and French science and technology parks. *The International Journal of Entrepreneurship and Innovation*, *13*(4), 235–247.

Mian, S., & Hulsink, W. (2009). Building knowledge ecosystems through science and technology parks. In *Proceedings of the 26th IASP World Conference*, June 1–4, 2009, Research Triangle Park, NC, USA.

Millar, R., & Dickinson, H. (2016). Planes, straws and oysters: The use of metaphors in healthcare reform. *Journal of Health Organization and Management*, *30*(1), 117–132.

Ministry of Commerce (2019). *Export statistics.* [Report in Turkish] Retrieved from https://ticaret.gov.tr/istatistikler/dis-ticaret-istatistikleri (December 22, 2019).

Mitchell, G. R. (1999). Global technology policies for economic growth. *Technological Forecasting and Social Change*, *60*(3), 205–214.

MoIT (2021). *Technology development zones.* [Article in Turkish]. Retrieved from https://www.sanayi.gov.tr/istatistikler/istatistiki-bilgiler/mi0203011501 (September 16, 2021).

Morgan, G. (2006). *Images of organization.* Newbury Park, CA: Sage.

Nowotarski, P., & Paslawski, J. (2017). Industry 4.0 concept introduction into construction SMEs. In *IOP Conference Series: Materials Science and Engineering*, *245*(5), p.1–10.

OECD (1996). *The knowledge-based economy.* Retrieved from http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=OCDE/GD%2896%29 02&docLanguage=En (December 25, 2019).

Özüdoğru, A. G., Ergün, E., Ammari, D., & Görener, A. (2018). How Industry 4.0 changes business: A commercial perspective. *International Journal of Commerce and Finance*, *4*(1) 85–95.

Palmer, I., & Dunford, R. (1996). Conflicting uses of metaphors: Reconceptualizing their use in the field of organizational change. *Academy of Management Review*, *21*(3), 691–717.

Patton, M. Q. (2002). *Qualitative research and evaluation methods.* Thousand Oaks, CA: Sage.

Putnam, L. L., Phillips, N., & Chapman, P. (1996). Metaphors of communication and organization. In S. R. Clegg, C. Hardy, & W. R. Nord (Eds.). *Handbook of organization studies* (pp. 375–408). Thousand Oaks, CA: Sage.

Rodríguez, C., & Bélanger, E. (2014). Stories and metaphors in the sensemaking of multiple primary health care organizational identities. *BMC Family Practice*, *15*(1), 1–10.

Sevsay, H., Mıynat, M., & Aktaş, H. (2017). The examination of technology development park invesment models. [Article in Turkish] *Celal Bayar Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *24*(2), 447–467.

Siegel, D. S., Westhead, P., & Wright, M. (2003). Science parks and the performance of new technology based firms: A review of recent UK evidence and an agenda for future research. *Small Business Economics*, *20*(2), 177–184.

Şimşek, H. (1997). Metaphorical images of an organization: The power of symbolic constructs in reading change in higher education organizations. *Higher Education*, *33*(3), 283–307.

Technology Development Zones Law (2001). *Law on technology development zones*. Retrieved from http://www.wipo.int/edocs/lexdocs/laws/en/tr/tr092en.pdf (November 27, 2019).

THE (2019). *THE world university rankings 2020: Methodology*. Retrieved from https://www.timeshighereducation.com/world-university-rankings/world-university-rankings 2020-methodology (December 20, 2019).

Turkish Statistics Institute (2020). *Export statistics, December 2020*. [Report in Turkish]. Retrieved from https://data.tuik.gov.tr/Bulten/Index?p=Foreign-Trade-Statistics-December-2020-37412 (September 16, 2021).

UNESCO (2017). *Science parks around the world*. Retrieved from http://www.unesco.org/new/en/natural sciences/science-technology/university-industry partnerships/science-parks-around-the-world/ (December 29, 2019).

Van Geenhuizen, M., & Soetanto, D. P. (2008). Science parks: What they are and how they need to be evaluated. *International Journal of Foresight and Innovation Policy*, *4*(1–2), 90–111.

Vila, P. C., & Pages, J. L. (2008). Science and technology parks: Creating new environments favourable to innovation. *Paradigmes: Economia Productiva i Coneixement*, 141–149.

Westhead, P. (1997). R and D 'inputs' and 'outputs' of technology-based firms located on and off science parks. *R and D Management*, *27*(1), 45–62.

Yang, C. H., Motohashi, K., & Chen, J. R. (2009). Are new technology-based firms located on science parks really more innovative? Evidence from Taiwan. *Research Policy*, *38*(1), 77–85.

Yıldırım, A., & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri* [Qualitative research methods in social sciences]. Ankara: Seçkin Yayıncılık.

Yıldız, S., & Gizir, S. (2018). An investigation of academicians' perceptions about concepts of university, academicianship and scientific research through metaphors. *Hacettepe University Journal of Education*, *33*(3), 743–762.

Yin, R. K. (2009). *Case study research: Design and methods*. Thousand Oaks, CA: Sage.