The Importance of Technology Transfer Offices in University Industry Collaboration: KTÜ TTM Example

Dilek İSKENDER BALABAN*
Technology Transfer ARC
Karadeniz Technical University
Trabzon, Türkiye
dilekiskender@ktu.edu.tr

Beril DEĞERMENCİ
Technology Transfer ARC
Karadeniz Technical University
Trabzon, Türkiye
berildegermenci@ktu.edu.tr

Harun YÜKSEL
Finance Department
Avrasya University
Trabzon, Türkiye
harun.yuksel@avrasya.edu.tr

Eren YILMAZ
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
erenyilmaz@ktu.edu.tr

Sedanur KALYONCU
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
sedanursaglam@ktu.edu.tr

Emrah AYVAZ
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
emrahayvaz@ktu.edu.tr

Oktay YILDIZ
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
oktayyildiz@ktu.edu.tr

Yalçın AYKUT
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
yalcin.aykut@ktu.edu.tr

İslam YILDIZ
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
islamyildiz@ktu.edu.tr

Gözde SAĞLAM
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
gozdesaglam@ktu.edu.tr

Müslüm Serhat ÜNVER
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
serhatunver@ktu.edu.tr

Hülya SABIR
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
hulyahacisalihoglu@ktu.edu.tr

Kerim SÖNMEZ
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
kerimsonmez@ktu.edu.tr

Güler Tuğba GÜLTEKİN
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
gulertugbagultekin@ktu.edu.tr

Aleyna AYDIN
Technology Transfer ARC
Karadeniz Technical University
Trabzon / TÜRKİYE
aleynaaydin@ktu.edu.tr

ABSTRACT

Within the scope of the research, interviews were conducted with the participants on the subject in order to answer the question "What is the place of technology transfer offices within the framework of university-industry collaboration?" This study evaluated the place of Karadeniz Technical University Technology Transfer Application and Research Center (KTÜ TTM) within the framework of university-industry collaboration. In the study, qualitative research technique was used and "phenomenology" was used as the research design. The data in this research was examined with the descriptive content analysis method. Analysis was conducted in RStudio in order to analyze the collected qualitative data and determine emotional tendencies. According to the analysis results; It was seen that KTÜ TTM made significant contributions to raising the bar of success by using the potential of the university and had a positive effect in general. When similar studies in the literature are examined, it is seen that TTOs play an important role in university-industry collaboration. This study supports the theoretical discussions in the literature with a practical example. Since the study provides an evaluation specific to KTÜ TTM, it makes a local and specific contribution to the literature by examining the effects of TTOs in a different university and geographical region. This could fill the gap in the literature on the functioning of TTOs across different institutions and regions.

KEYWORDS

Technology, technology transfer office, university industry cooperation, KTÜ TTM

*Dilek İSKENDER BALABAN is corresponding author of the ARC for Technology Transfer Karadeniz Technical University in Trabzon, Türkiye.

1.INTRODUCTION

Technology Transfer Offices (TTOs) are organizational structures that play a role in directing academic research towards national and international research projects, facilitating its transfer to industry, and commercializing it. In general, TTOs located within universities act as intermediaries between universities, research institutes, students, investors, and companies. They engage in activities such as establishing connections and making matchings according to the necessary needs.

In Türkiye, TTOs provide consultancy and support to all stakeholders throughout the entire process, from transforming knowledge into products, selecting industrial partners, identifying appropriate funding sources, project development activities, intellectual property and industrial property rights applications, to commercialization and/or the establishment of academic-based firms [10].

As intermediary organizations, TTOs operate according to various strategies based on the past experiences of academic and industrial actors and the quality of the information conveyed in the university-industry collaboration process. TTOs particularly focus on enhancing cognitive and organizational domains. They play a crucial role in bringing together actors with different visions, ways of interpreting life, and perspectives on the world [11].

The collaboration between two distinct entities, universities and industry, can contribute to national development; however, this is achievable only if the process is managed with sound and appropriate strategies. Nowadays, while collaborations between universities and industry can occur through various

communication channels apart from the support of technology transfer offices, the outcomes of these collaborations are often quite weak [7].
A review of the literature reveals that technology transfer offices (TTOs) play a significant role in enhancing and sustaining university-industry collaboration.

1.1 University Industry Collaboration

University industry collaboration ensures that the knowledge gained from research activities conducted at universities is not only published but also transformed into practical applications. It is a collaborative method aimed at and implementing the transfer of technological developments and knowledge to production stages according to industrial needs [13]. The cultural differences between universities and industry contribute to the diversification of research approaches [9]. Effective collaboration between industry and academia requires a special alignment; understanding mutual interests, setting common goals, and focusing on complementary skills form the basis for achieving successful collaboration [6].
As a result of collaboration, industry, whose goal is to increase profits and expand its volume, has seen developments that positively impact production through the adaptation of technologically evolving and renewing processes to existing systems. The aim of the university in collaborating with industry is to develop a qualified human resource and support research with a strong knowledge base, leading to the transformation of theoretical work into practical applications and resulting in some modifications [5]. Science plays an extremely important role in facilitating university-industry collaborations. It is a process born from the mutual supply and demand between the university, which produces science, and industry, which converts science into economic benefits [2].
University-industry collaboration highlights a partnership that offers significant benefits for both parties. Through these collaborations, universities strive to address global problems using academic knowledge. Industry, on the other hand, benefits from universities' research, expertise, and laboratories, leading to the development of innovative products and improvements to existing products. As a result of this partnership, mutual gains are achieved in areas such as employment, education, innovation, and economic growth, which significantly impact life. Thus, these partnerships provide mutual benefits to the parties involved and contribute to society and the economy. In addition to their research mission, universities also have educational and societal missions. While the educational mission is clear, societal missions have gained increasing importance in recent years. This is reflected in factors such as the role of universities in university-industry technology transfer [4].

1.2 University Industry Collaboration Activities of KTÜ TTM

In order to increase R&D and innovation capacity and strengthen university-industry cooperation activities, KTÜ TTM establishes contacts with many new companies every year and develops bilateral cooperation. These efforts are not limited to the region but extend to firms across the country through online and face-to-face meetings, integrating new companies into the collaboration ecosystem. During these meetings, R&D topics and requests are gathered, the needs of the firms are identified, and numerous firms are matched with academicians from KTÜ for collaborative projects, involving online meetings and discussions.
Meetings are also organized with the boards of Organized Industrial Zones to discuss activities within the framework of university-industry collaboration. Firms are prioritized and analyzed, and guidance is provided based on current calls for proposals. Information on academicians' research that can be applicable in the industry or discussions on potential collaborations with industrial organizations are conducted.
During the application phase of university-industry collaboration projects, the entire process of project review, preparation, and submission of application documents is carried out. Legal matters and contracts are prepared jointly with the university's legal counsel. Once a project is approved for funding, support such as accounting transactions, completion of documentation, and signature processes are provided to firms and academicians by the administrative and financial affairs unit established within KTÜ TTM.

2. METHODOLOGY

2.1 Research Methodology and Research Design

In this study, the role of KTÜ TTM within the framework of university-industry collaboration was evaluated. A qualitative research method was employed, and the research design was based on "phenomenology." The phenomenological design typically focuses on phenomena that are recognized but not deeply or thoroughly understood. Phenomenology is a method that concentrates on understanding and evaluating lived experiences [8]. This methodology aims to deeply examine and comprehend individuals' experiences.
Although phenomenological data are obtained from the experiences of a few individuals, the information gathered from these individuals provides detailed insights into the phenomenon. The fact that the phenomenon is experienced by different individuals contributes to the provision of information from various perspectives by the research participants, thereby aiding in understanding the phenomenon from a broad viewpoint. In this way, the data obtained from the experiences of different participants support a comprehensive understanding of the phenomenon [3]. For such research, the number of individuals to be included in the sample should generally not exceed ten. It is normal to limit the sample size in this type of research since the interviews often require long and sometimes multiple meetings. The limited number of individuals who have experienced the phenomenon under investigation may also sometimes result in a restricted number of people who can be included in the sample [12].
In addition, sentiment analysis was performed using RStudio to automatically detect and classify emotional expressions present in the texts. This analysis employs Natural Language Processing (NLP) techniques to determine whether the sentiments in the texts are positive, negative, or neutral. During this process, words and expressions within the texts are analyzed to identify the emotional content.
To visually understand the key themes, topics, and word distribution in the texts, a word cloud was generated in RStudio. Word clouds, commonly used as part of text mining and data visualization techniques, provide a quick representation of the frequency of words in a text or text corpus, indicating which words are used more frequently.

2.2 Universe and Sample of the Research

The universe of this research consists of approximately 50 faculty members working at KTÜ who have been involved in university industry collaboration processes. To align with the research objectives, the sample group was composed of 8 faculty members who have both participated in university industry collaboration processes and are knowledgeable about the KTÜ TTM. The academic titles, faculty and department affiliations,

and the total number of projects funded by public and/or private sector capital for the faculty members included in the sample group are provided in Table 1.

2.3 Data Collection Processes and Interview Questions

Within the scope of the research, interviews were conducted with relevant participants to answer the question, "What is the role of KTÜ TTM in the context of university-industry collaboration?" Participants were informed that the interviews would be audio recorded by the researcher, but their personal data would not be shared with third parties. It was explained that the audio recordings would be used for the purpose of data collection and analysis. Initially, a pool of questions presumed to be relevant to the study topic was created. Subsequently, the questions within this pool were evaluated with experts deemed relevant to the research content, and the most appropriate eight questions for the study were finalized. The interview questions prepared for the participants are presented in Table 2. Before the interview questions were posed, a conversation with the participants was initiated to foster a mutual trust relationship. After the audio recordings were transcribed, with the permission of the participants, the next step was the analysis of the data. The collected data was analyzed using descriptive content analysis, and additionally, sentiment analysis was conducted, and a word cloud was generated using the RStudio program.

Table1: Characteristics of the Study Sample Group

Academic Title	Faculty/Departments	Number of Public /Private Sector Supported Projects
Professor	Forestry Faculty Forestry Industrial Engineering	10
Professor	Faculty of Engineering Mechanical Engineering	6
Professor	Faculty of Engineering Mechanical Engineering	2
Associate Professor	Faculty of Engineering Industrial Engineering	4
Assistant Professor	Faculty of Science Computer Science	6
Assistant Professor	Faculty of Science Computer Science	6
Assistant Professor	Vocational School of Health Services Medical Services and Techniques	3
Research assistant	Forestry Faculty Forestry Industrial Engineering	2

Table 2: İnterview Questions

No	İnterview Questions
1	What are your opinions about KTÜ TTM?
2	How would you define university industry collaboration?
3	Do you think KTÜ TTM is effective in the processes of university industry collaboration?
4	Why would you prefer KTÜ TTM to be an intermediary in university industry collaboration processes?
5	What are your expectations regarding KTÜ TTM's university industry collaboration module?
6	Is there any aspect of KTÜ TTM's university industry collaboration processes that you find lacking?
7	In your opinion, how could KTÜ TTM become more active in the context of university industry collaboration?
8	Has the solution/process of the problems you experienced in university-industry collaborations at KTÜ TTM become easier?

2.4 Research Findings

The findings of the study are summarized as follows:

KTÜ TTM has made significant contributions to raising the bar of success by utilizing the potential of the university. Active TTOs are essential units that every university must have. They are crucial in presenting the university as professional and institutional in industrial collaborations and play a critical role in reducing the risks researchers may encounter during the project development process.

KTÜ TTM has been highly effective in conducting one-on-one meetings with firms, matching academics, providing project writing support, analyzing industrial problems, and guiding both parties on the appropriate course of action throughout the process. It has also played a significant role in realizing many of the university's recent collaborations. However, it is observed that KTÜ TTM faces a disadvantage due to its location being far from major industrial areas. It is suggested that the center could become more effective by organizing events where industry professionals and academics can come together and by placing greater emphasis on institutionalization.

It is noted that KTÜ TTM is preferred as an intermediary because it instills confidence in the industrial sector during company visits and ensures that academics feel secure. Its professional and corporate identity during industry visits, which represents the university, leads to a more positive and moderate view of the project development processes among industrialists. Additionally, KTÜ TTM is favored for its objective approach to both academics and industry parties, its facilitation of smooth process progress, its role as a mediator, and its handling of accounting tasks.

KTÜ TTM is believed to be doing its best to achieve its goals. Additionally, there are expectations for bringing academics along on company visits, conducting matching processes more meticulously, collecting project topic requests from academics based on company activity areas, and matching academics with large-scale companies in the Technopolis where they have their firms.

It is generally believed that KTÜ TTM does not have significant shortcomings. However, suggestions have been made, including collecting R&D topic proposals from academics and forwarding them to companies, grouping companies sectorally to hold meetings with academics on specific days, providing support with sample project forms, and facilitating discussions and integration between academic entrepreneurs and companies.

To increase its activity, it is suggested that KTÜ TTM could increase its participation in fairs, fix the names of the companies it works with on its website, enhance materials for promoting TTO's module functions and staff, utilize international resources, and raise awareness among companies about TTO activities.

It is believed that TTO plays a facilitative role in reviewing and preparing contracts between academics and industrialists, managing financial obligations, handling bureaucratic processes, and establishing balances between the company and the academic. Additionally, it is noted that TTO helps eliminate problems by coordinating the project development processes for companies that are located far away.

The data obtained from the interviews was converted into a text file and sentiment analysis was performed using the RStudio program. The graph showing the sentiment scores obtained from the analysis is presented in Figure 1.

Subsequently, a word cloud was created using the Rstudio program to analyze frequently used words within the text. The resulting word cloud is presented in Figure 2.

Figure 1: Distribution of Sentiment Scores

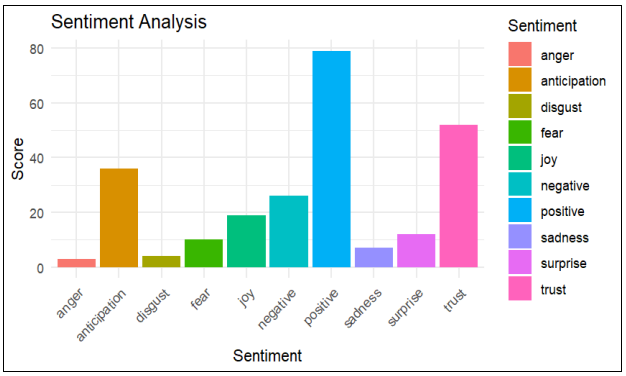

Figure 2: Word Cloud

3. CONCLUSION AND RECOMMENDATIONS

In conclusion, it has been observed that the activities carried out by the KTÜ TTM within the framework of university industry collaboration have yielded positive results, as noted by participants who are familiar with the structure and functioning of the TTO and have been involved in the university industry collaboration processes. Furthermore, it has been concluded that the TTO has positively influenced its corporate image. The study [1] supports this finding, as it concluded that TTOs positively impact the innovation capacity within firms, with 47% of firms' innovation capacity being provided by TTOs.

Upon evaluating the sentiment analysis scores presented in Figure 1, it is observed that a high score corresponds to a positive sentiment. This result indicates that the university-industry collaborations carried out with KTÜ TTM generally have a positive impact. It demonstrates that stakeholders being satisfied with the collaboration and experiencing positive outcomes.

The high level of trust indicates that KTÜ TTM has established a strong trust relationship between university and industry stakeholders and is recognized as a reliable partner. The high level of anticipation reflects the high expectations for future projects and potential opportunities in collaborations with KTÜ TTM.

Based on the sentiment analysis results, we can conclude that KTÜ TTM's role and significance in university industry collaboration are highly positive. The high levels of positive emotions and trust demonstrate that the collaborations are being conducted successfully and that stakeholders are satisfied, while the low levels of negative emotions suggest that the processes are running smoothly and are being managed effectively. This proves that KTÜ TTM is a reliable and effective interface that strengthens the collaboration between the university and industry.

In the word cloud presented in Figure 2, the words 'industry,' 'university,' and 'TTO' are prominently featured. The frequent occurrence of the word 'industry' indicates a strong focus on how KTÜ TTM interacts with and supports industrial partners. The frequent mention of the word 'university' underscores the importance of the academic side of the collaboration, suggesting that researchers view the university's role as critical in partnering with industry. The prominent presence of the abbreviation 'TTO' highlights the central role of KTÜ TTM in facilitating these collaborations. Overall, the word cloud demonstrates the significant role that KTÜ TTM plays in supporting and facilitating these interactions.

The current situation of KTÜ TTM has been evaluated, and the following recommendations have been proposed:

Increasing awareness of the services provided by TTO and conveying this awareness to the business ecosystem will enhance the sustainability of new collaborations. Organizing events that bring together universities and industry can foster more communication between them. The strong relationships established will increase the sense of trust, thereby creating opportunities for further collaboration. Additionally, such efforts will create internship and job opportunities for students trained at the university for the business world.

In future studies, the place of TTOs can be examined within the framework of commercialization of inventions within the university and/or increasing academic entrepreneurship. By increasing the number of study samples, the subject can be analyzed in depth with different analysis methods and theoretical frameworks can be tested. In addition, the role and impact of TTOs in different universities, regions and different countries in university-industry collaboration can be examined by conducting multiple case studies. It will be useful to compare different structures and operations of TTOs in terms of examining the impact of different regional and sectoral dynamics on collaboration processes.

REFERENCES

[1] Abdulai, A. F., Murphy, L., Thomas, A., & Thomas, B. (2022), Technology Transfer Offices and Their Role with Information Mechanisms for Innovation Performance in Firms: The Case of Ghana. Knowledge, 2(4), 719-734.

[2] Akdoğan, A. (2007), The Functionality of Research and Application Centers in Universities (s. 85-104). Ankara: Detay Publishing

[3] Baker, C., Wuest, J. & Stern, P.N. (1992), " Method Slurring: the Grounded Theory/ Phenomenology Example". Journal of Advanced Nursing, 17, 1355-1360.

[4] Blankesteijn, M., Bossink, B., & van der Sijde, P. (2021), Science-based entrepreneurship education as a means for university-industry technology transfer. International Entrepreneurship and Management Journal, 17(2), 779-808.

[5] Eryanık, A. (2018), The Impact of University-Industry Collaboration on Employment: The Case of Uşak. Published Master's Thesis. Afyonkarahisar: Afyon Kocatepe University.

[6] Fasi, M. A. (2022), An Overview on patenting trends and technology commercialization practices in the university Technology Transfer Offices in USA and China. World Patent Information, 68, 102097.

[7] Güler, M., & Kırbaşlar, İ. (2020), The Role of Technology Transfer Offices in University-Industry Collaboration, Iktisad Publishing

[8] Jasper, M. A. (1994), "Issues in Phenomenology for Researchers of Nursing". Journal of Advanced Nursing, 19, 309-314.

[9] O'Dwyer, M., Filieri, R., & O'Malley, L. (2023), Establishing Successful University İndustry Collaborations: Barriers And Enablers Deconstructed. The Journal of Technology Transfer, 48(3), 900-931.

[10] Temel, S., Dabić, M., Ar, I. M., Howells, J., Mert, A., & Yesilay, R. B. (2021), Exploring The Relationship Between University İnnovation İntermediaries And Patenting Performance. Technology in Society, 66, 101665.

[11] Villani, E., Rasmussen, E., & Grimaldi, R. (2017), How İntermediary Organizations Facilitate University–İndustry Technology Transfer: A Proximity Approach. Technological Forecasting And Social Change, 114, 86-102.

[12] Yıldırım, A. & Şimşek, H. (2013), Qualitative Research Methods in Social Sciences (9th Edition). Ankara: Seçkin Publishing.

[13] Yücel, İ. H. (1997), Science and Technology Policies and the 21st Century Society. In Science and Technology Policies and the 21st Century Society (p. 76). Ankara: State Planning Organization.