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TECHNOLOGY TRANSFER OFFICES IN THE MANAGEMENT OF INTELLECTUAL AND INDUSTRIAL PROPERTY RIGHTS IN TURKISH UNIVERSITIES: PRACTICES, CHALLENGES, AND OPPORTUNITIES

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ABSTRACT

Outputs of academic research conducted at universities may involve inventions that are subject to intellectual and industrial property rights. University technology transfer offices (TTOs), which play a vital role in the commercialization of academic knowledge, bear significant responsibilities for the protection of these inventions. This study aims to identify the practices, challenges, and opportunities related to the execution of intellectual and industrial property rights processes in Turkish universities and to demonstrate the importance of technology transfer offices in this regard. To achieve this objective, a mixed-method approach was adopted, and a questionnaire consisting of open-ended and closed-ended questions was completed by 96 individuals appointed as Industrial Property Consultants by the Turkish Patent and Trademark Office (TÜRKPATENT). The collected data were analyzed using thematic coding, descriptive statistics, and difference tests. The study concluded that technology transfer offices generally play an important role in raising awareness regarding intellectual and industrial property rights and in managing these processes within universities. Additionally, it was observed that TTOs experience difficulties in finding qualified personnel and in the process of commercialization. Furthermore, it was determined that the number of transactions carried out in TTOs varies according to the professional certifications held by employees and the support programs utilized. Recommendations were provided to administrators regarding the implementation of activities to increase awareness of the importance of TTOs, the training of qualified personnel, and maximizing the utilization of support programs.

KEYWORDS: Technology Transfer Offices, Intellectual and Industrial Property Rights, IP Commercialization, Academic IP.

1. INTRODUCTION

Universities are institutions where diverse scientific research is conducted, researchers and specialists in relevant fields are trained, and scientific knowledge is produced. As preeminent knowledge institutions, universities can be defined as units providing higher education (Günay, 2022). Universities play a crucial role in enhancing the knowledge base of nations to cultivate a qualified and high-quality human capital, as well as in meeting the increasing demand for goods and services resulting from economic development and regional growth. Consequently, universities serve as a source of power and value for development. An uneducated and unqualified population constitutes merely a burden and a base of consumers (Gündüz, 2017).

University students and academics/researchers conduct various academic studies to graduate, achieve academic promotions, benefit from incentives and supports, or secure positions in index rankings (Ölmez, 2025:286). These efforts result in the production of substantial knowledge and technologies—namely, inventions. However, the knowledge and technology generated within universities must not remain confined to books, lecture notes, seminars, or articles. It is essential to meticulously identify and protect studies that possess practical utility, industrial relevance, and commercialization potential. Such protection contributes to the development of the academician, the industry, the institution, and the nation alike.

Securing knowledge and technology before they are transferred to industry and commercialized is a critical matter to prevent imitation and intellectual theft. For this reason, academic research outputs may occasionally include inventions subject to intellectual and industrial property rights. In the protection of academic work, intellectual and industrial property rights come to the fore, necessitating the involvement of expert teams to manage the protection, supported development, and commercialization of these studies. In many universities, these activities are carried out by technology transfer offices. Technology transfer offices (TTOs) can be defined as offices established to contribute to university-industry collaboration and the commercialization of knowledge produced within universities (TÜBİTAK, 2017). One of the primary functional areas of these offices is intellectual and industrial property rights. These units manage the protection and commercialization activities of the knowledge and technology produced within their respective institutions from an intellectual and industrial property perspective. From this viewpoint, TTOs hold immense significance in the transfer of academic knowledge to industry.

This study aims to reveal the practices, challenges, and opportunities in the management of intellectual and industrial property rights in Turkish universities, demonstrate the impact of TTOs in this management process, and present the findings by analyzing data regarding their current status.

1.1. Technology Transfer Office and Intellectual and Industrial Property Rights

A Technology Transfer Office (TTO) is an entity established to contribute to university-industry collaboration and the commercialization of knowledge produced within the university. The primary objectives of TTOs include facilitating the transformation of knowledge and technology generated in higher education institutions into applications to create economic, social, and cultural value; establishing and enhancing collaborations between universities and private sector organizations; assisting in the production of knowledge and technology required by the industry within the university; and contributing to the transfer of knowledge/technology and the development of tangible outputs through these partnerships. TTOs established for these purposes generally operate under five modules (main functional areas) (TÜBİTAK, 2017):

- Awareness, promotion, information, and training services
- Services for utilizing support programs
- University-industry collaboration activities
- Management of intellectual and industrial property rights and licensing services
- Incorporation and entrepreneurship services

The technology transfer process does not occur spontaneously; technology transfer offices are a formal mechanism for transferring technology and knowledge from research institutions to the private sector (Young, 2007). Specialized technology transfer offices are effective in developing the relationship between universities and industry. Technology transfer offices enable universities to specialize in areas such as creating collaborative projects, managing intellectual and industrial property rights, benefiting from support programs, and business development (Macho-Stadler, 2007:484).

In recent decades, universities have increasingly been expected to contribute more to society. Beyond conducting research and disseminating knowledge through teaching and publication, their contribution to economic growth and entrepreneurial activities is frequently scrutinized (Baglieri et al., 2018: 61).

Generally, one of the core functional areas of TTOs, which act as a bridge between the university and industry in the commercialization of knowledge, is the management of intellectual and industrial property rights and licensing services. Through these services, the rights to academic studies are protected, and commercialization processes are executed without the loss of rights, thereby contributing to economic growth. Technology Transfer Offices (TTOs) evaluate the research of university researchers, assess whether an invention has been developed, conduct studies on commercialization by academic groups, and generally gather suitable packages and project topics for collaborative projects. Therefore, Technology Transfer Offices (TTOs) are very important units for universities in terms of the services they provide (Goldfarb and Henrekson, 2003: 646).

Intellectual rights are the rights granted to the owners of innovations that are products of human thought. Intellectual rights are divided into two categories: copyrights and industrial property rights. Copyrights are legal rights provided over products created through an individual's intellectual effort. According to legislation, for an intellectual or artistic product to be accepted and protected as a "work" (eser), it must be the product of intellectual effort, bear the characteristics of its owner, be shaped into a form, and fall into one of the categories of works specified by law. Artistic, scientific, musical, cinematic, architectural, and literary works, as well as comic characters, maps, photographs, web pages, computer programs, and sculptures, are outputs subject to copyright. Applications for the protection of such works are submitted to the Republic of Türkiye Ministry of Culture and Tourism, General Directorate of Copyrights (Ministry of Culture and Tourism, 2025).

Industrial property rights are rights that ensure the registration of inventions, innovations, new designs, and original works—such as trademarks, patents, designs, utility models, and geographical indications—on behalf of their first practitioners. These rights grant owners the exclusive authority to produce and sell the product for a specific period, particularly regarding signs that distinguish the producer or seller of goods in the commercial sphere. A trademark is any sign used to distinguish the goods and services of one enterprise from those of others. Design creates innovation and differentiation in products, providing functional and visual novelty. It refers to the appearance of the whole or a part of a product, or its ornamentation, resulting from features such as lines, shapes, forms, colors, materials, or surface textures. In design protection, the external appearance related to the whole or part of two- or three-dimensional products is considered. Third parties cannot produce, market, sell, import, use for commercial purposes, or possess for these purposes a protected design or a product incorporating the design without the owner's consent. A geographical indication is a sign indicating a product that has identified with a specific locality, area, region, or country in terms of a distinct quality, reputation, or other characteristics. The advantage of geographical indications and traditional specialty guaranteed names over other industrial property rights is that they protect all persons producing and marketing under specific conditions, rather than a single producer. This is because geographical indications and traditional specialty names possess a spatial, local, regional, or national generality—essentially anonymity—and the rights they provide cannot be linked to a specific individual. They grant rights to everyone who meets the conditions specified in the registration certificate. The actual producers of the product primarily benefit from the protection provided by these registrations (Turkish Patent and Trademark Office, 2025).

The concept particularly emphasized within the scope of this study is the patent. A patent represents monopoly rights granted to the patent holder for a limited period and specific jurisdiction to prevent the unauthorized production, sale, use, or importation of the invention by third parties. The document indicating that the right to use this invention belongs to the applicant is called a Patent Certificate. For a study to be eligible for a patent certificate, it must meet the criteria of novelty, inventive step, and industrial applicability. The protection period for a certified patent that meets these conditions is 20 years. While patent applications are national, the search for novelty is conducted on a universal scale. In addition to patent applications for inventions, the option of a utility model application is also available. To obtain a utility model registration, it is sufficient for the invention to be globally novel and industrially applicable. The protection period for a utility model is 10 years (Turkish Patent and Trademark Office, 2025). Industrial property applications in Türkiye are submitted to the Turkish Patent and Trademark Office (TÜRKPATENT).

Academics and researchers conducting academic studies in higher education institutions may produce inventions that are subject to patents. The procedures and principles regarding the protection of these inventions in Türkiye were established by the regulation published in the Official Gazette No.

30195 on September 29, 2017. The "Regulation on Employee Inventions, Inventions Realized in Higher Education Institutions, and Inventions Arising in Publicly Supported Projects" defines the price tariff for employee inventions, the path to be followed in case of disputes, and the procedures regarding inventions realized in higher education institutions or arising from projects supported by public institutions and organizations. Article 29 of this regulation states: "Inventions realized as a result of scientific studies or research conducted in higher education institutions shall be reported in writing and without delay by the inventor to the relevant unit designated by the higher education institution." Consequently, employees of higher education institutions are obliged to disclose their inventions to their universities if they believe their work warrants any industrial property right protection.

In almost most universities in Türkiye, academics, researchers, or students report their inventions to technology transfer offices or similar units, which then manage all processes related to these inventions. Technology transfer offices or similar units provide services such as informing/raising awareness among university employees regarding intellectual and industrial property rights, guiding the determination of applicant ownership and application types, managing the application process, following up on subsequent filings, and providing support for commercialization and licensing. Each university manages the intellectual and industrial property rights process through different strategies, practices, and methods. Due to this diversity, universities offer certain opportunities while also facing specific challenges.

Examination of the literature reveals numerous studies on technology transfer offices. In their research, Değerli and Tolon (2016) conducted a study to determine critical success factors for technology transfer offices (TTOs) or derivative organizations, which are essential instruments in the context of contemporary university/research organization–industry collaboration. At the conclusion of the study, 11 factors, 67 items/characteristics/situations related to these factors, and the relationships between them were identified in the context of critical success factors for TTOs.

Çengel and Binark (2019) examined the impact of practices carried out by a technology transfer office within a university—using the project management components of the IZU Entrepreneurship and Incubation Unit—on entrepreneurship and incorporation. The study emphasized that for universities to achieve national strategic goals, producing scientific knowledge alone is insufficient; the incorporation of TTO units in the preparation and management of entrepreneurship and R&D projects, as well as the commercialization of their outputs, is the most significant indicator of a university's mission to become a research university. Furthermore, it was noted that in foundation universities that establish TTO units as administrative bodies, administrative and procedural processes follow one another, causing researchers, experts, and entrepreneurs to experience significant time loss due to university procedures. This hinders the achievement of expected targets and ultimately reduces the efficiency and success indicators of TTO units that cannot maintain their functionality.

Çatal (2024) conducted a detailed study on the role and importance of technology transfer offices in facilitating knowledge and technology transfer from universities to the sector. This work aimed to contribute to the technology transfer literature by enabling the recognition of TTOs by both universities and industry.

In the study by Güler and Kırbaşlar (2020), the impact of Technology Transfer Offices—a vital interface mechanism in university-industry collaboration—on innovation-centered entrepreneurship and Intellectual and Industrial Property Rights in Türkiye was examined. Similarly, in his thesis, Güler (2018) separately addressed the importance of TTOs in university-industry collaboration, their contributions to entrepreneurship, and their role in the development of IPR. The study sought to reveal the current status of TTOs, the quality of personnel, and their significance in fostering an entrepreneurship culture and university-industry cooperation. Consequently, it was concluded that TTOs play a critical role in the commercialization of university-generated knowledge and the overall development of the country.

Geuna and Nesta (2006) investigated data regarding the growth of university-owned and university-invented patents. Their study found evidence that university patenting is increasing in Europe; however, they observed that this phenomenon is heterogeneous across different countries and disciplines. Additionally, they found no evidence that university licensing is profitable for most institutions, though a small number of universities succeeded in generating significant additional income.

Van Zeebroeck et al. (2008) examined the sharp increase in university patents over the last 20 years,

addressing the issues of academic reproduction and dissemination across three fundamental questions. The study showed that patenting academic outputs has an impact on aspects, speed, and quality. Furthermore, it concluded that there are potential benefits to research in academic patenting.

Sellenthin (2009), based on publications from a survey conducted among professors in Sweden and Germany, analyzed the characteristics of researchers' decisions regarding industrial property rights and noted that technology transfer offices were particularly prominent in this regard. He concluded that researchers with traditional experience were more likely to have options for submitting patents.

Saragossi and Van Pottelsberghe (2003) revealed a sharp increase in patenting activities by Belgian universities, particularly in the Flemish Region, since the late nineties. They attributed this increase to two major changes: first, new technological opportunities arising from research activities in the biotechnology sector, and second, an increased propensity for Belgian universities to patent the technologies they developed. The study concluded that this increased propensity also stemmed from more effective technology transfer offices.

From the perspective of the economic theory of patents, Verspagen (2006) emphasizes that universities, funded by public resources, are obligated to produce knowledge beneficial to society, and argues that protecting knowledge developed by university researchers through patents creates a contradictory situation. In contrast, the debates surrounding the Bayh-Dole Act in the United States argue that patenting university inventions can be a necessary tool for accelerating technology transfer between universities and the private sector. The first part of the article focuses on two fundamental questions: What is the economic rationale behind the Bayh-Dole Act, and how has this Act affected universities and the knowledge they produce? The second part examines the applicability of Bayh-Dole-like regulations to European countries; in this context, the university patenting practices in Europe and the results of the Bayh-Dole Act in the US are analyzed comparatively.

Coupe (2003) noted that while many studies show the indirect effects of academic research by linking it to corporate patents, since the Bayh-Dole Act, universities have been allowed to patent federally funded inventions and retain the royalties generated. The study used traditional econometric techniques to predict the emergence of patents in the American university patent system. As a result, it was found that increased spending on academic reviews increased patentability. The relationship between patentability and patentability was found to be similar to that in firms. Additionally, predictions were presented regarding the impact of TTOs (Technology Transfer Offices) on the emergence of university patents.The study suggested that if high-spending universities tend to have a TTO and if this office is effective in converting inventions into patents, a positive coefficient on the R&D variable would be obtained.

Uzunallı (2015) examined the current legal status of inventions by university faculty members, the proposed regulations in the draft law, and the amendment to paragraph 42 of the German Employee Invention Act to shed light on Turkish law. The study concluded that the commercialization of university research outputs is crucial and that universities must play an active role in this process; thus, the "professor's privilege" (free invention privilege) was abolished. However, it was also noted that abolishing this privilege alone is insufficient for universities to adapt to innovation processes; the failure to adequately establish patent and evaluation systems within universities could lead to the institution's inability to fulfill its obligations.

Yaşar (2020) states that R&D expenditures and the number of patent applications are two primary criteria that can be used as indicators of technological development. In his study, he aimed to demonstrate the effects of university-industry collaboration in R&D on patent applications using 2019 data from 108 countries through statistical methods. The study determined a statistically significant difference in the number of patent applications for country groups with low-high and medium-high levels of university-industry collaboration in R&D; on the other hand, no significant difference was observed among groups with low-medium levels of collaboration. According to the research findings, it was concluded that high-level university-industry collaboration in R&D is one of the most critical factors affecting patentable products and services.

Leydesdorff et al. (2015) concluded that after a relatively stable plateau between 1998 and 2008, the long-term trend toward an increasing share of university patenting in total patenting has resumed. They attributed this resurgence to the internationalization of academic entrepreneurship and the continued evolution of university technology transfer in the United States.

In their study aimed at identifying legislative barriers encountered in the commercialization process of inventions realized in higher education institutions in Türkiye and offering solutions to

remove these obstacles, Baykal and Şahin (2020) examined the commercialization processes and practices in Türkiye and globally by analyzing statistical data. As a result of the research, barriers in this field were identified, and it was determined that the majority of these obstacles stem from deficiencies and ambiguities in the legal regulations in Türkiye. To resolve the six identified obstacles and uncertainties, the study proposed amendments to existing regulations and the introduction of additional legal frameworks.

Starting with the question, "Which national policies are most effective in promoting the commercialization of university-sourced knowledge?" Goldfarb and Henrekson (2003) characterized and evaluated the policies followed in Sweden and the USA—two countries that allocate significant resources to university R&D but follow distinctly different models regarding commercialization. The study emphasized that granting ownership rights to the inventor does not automatically create the best incentives for commercialization. To facilitate participation in commercialization activities, an academic inventor must not only encounter strong incentives in the technology market but also must not face strong deterrents (barriers) within the university environment. Furthermore, it was underlined that universities must be independent/autonomous and competitive for the successful commercialization of academic knowledge produced within these institutions.

Caldera and Debande (2010: 1160) examined the impact of policy tools on performance using data from universities in Spain, thus contributing to the literature on university technology transfer. Their findings indicate that universities with institutionalized policies and procedures related to technology transfer exhibit higher performance. Furthermore, universities with larger and more experienced technology transfer offices (TTOs) were found to have higher volumes of contracted research. Conversely, the study concluded that the structural characteristics of TTOs have a relatively limited impact on university performance in terms of licensing activities and spin-off company establishment. The study also indicated that universities with science parks perform better than those without, suggesting that the concentration of knowledge spillovers in proximity to universities has a positive impact on technology transfer performance. Additionally, they noted that allocating a higher share of licensing royalties to inventors encourages licensing activities, and allowing academics to establish new firms leads to a higher number of spin-offs.

Okamuro and Hishimura (2012) explored the impact of university intellectual property policies on the performance of university-industry collaboration. Their research demonstrated that the IP policies of partner universities regarding equity and flexibility are of significant importance.

Research inevitably brings intellectual property to light. Thursby and Kemp (2002) presented striking results in their study examining the emergence and management of intellectual property with commercial potential. The study found that inefficiencies arise from universities' preferences for, or specialization in, outputs unrelated to licensing activities rather than from a lack of licensing competencies. Interestingly, they observed that the lower the research quality of a university, the more efficient it tends to be in commercial activities; they attributed this to the fact that faculty members conducting higher-quality research specialize more deeply in basic research. Furthermore, the study highlighted significant growth in the commercial activities of universities, driven both by the changing environment regarding commercialization within institutions and industry's increasing desire for university technologies. Finally, it was revealed that biological sciences and engineering yield more significant results in terms of licensing activity compared to the physical sciences.

When the studies conducted as a result of the literature review are examined, this research distinguishes itself from existing studies in many respects. Through this study, it is aimed to identify the practices, challenges, and opportunities regarding intellectual and industrial property rights in Turkish universities and to demonstrate the significance of technology transfer offices in this context.

2. MATERIALS AND METHODS

2.1. Participants and Setting

This study was conducted in Türkiye between February and April 2025. The population of the study consists of 127 Industrial Property Consultants employed at universities, as listed by the Turkish Patent and Trademark Office (TÜRKPATENT-SMDB, 2025).

To achieve the research objective and address the research questions, a questionnaire was administered to individuals who manage intellectual and industrial property rights processes at universities in Türkiye and are also appointed as Industrial Property Consultants by the Turkish

Patent and Trademark Office. Through this approach, it was ensured that the questions were answered by professionals with a high level of expertise in the management of intellectual and industrial property rights within the university ecosystem. The scope of this study comprises the responses provided to the questionnaire titled "Technology Transfer Offices in the Management of Intellectual and Industrial Property Rights in Universities: Practices, Challenges, and Opportunities," which was directed to officials managing these processes.

The data collection process was concluded after reaching 96 participants on a voluntary basis, representing approximately 75% of the total population. The online version of the questionnaire was shared across electronic platforms where all industrial property consultants in Türkiye are represented. The demographic characteristics of the 96 respondents are presented in Figure 1 and Figure 2.

The descriptive findings regarding the participants who completed the questionnaire are as follows: of the 96 participants, 52 are female and 44 are male. Regarding their educational background, 25 participants hold a bachelor's degree, 42 participants hold a master's degree, and 29 participants hold a doctoral degree. The participants' ages range from 27 to 60, with an average age of approximately 40.

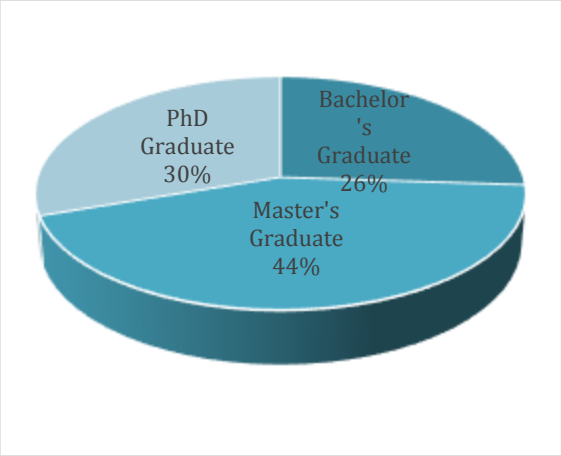

Figure 1: Distribution of Participants' Education Levels.

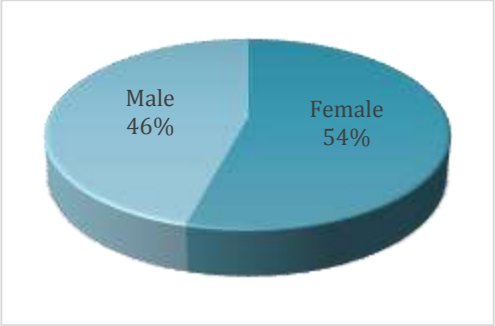

Figure 2: Gender Distribution of Participants.

2.2. Data Collection

To comprehensively analyze the research question, a mixed-methods design incorporating both quantitative and qualitative data was utilized. Both types of data were collected concurrently, with meticulous attention paid to ensuring the absence of contradictory, missing, or inconsistent results. During the development of the questionnaire, significant emphasis was placed on ensuring that the questions were clear and easily understood.

The study aims to identify the practices, challenges, and opportunities related to the management of intellectual and industrial property rights (IPR) processes in Turkish universities and to demonstrate the importance of technology transfer offices (TTOs) in this regard. To achieve this objective, a questionnaire consisting of three sections and a total of 46 questions was developed, grounded in the literature review on TTO and IPR provided in Section 1.1.

Section 1: Contains 27 questions aimed at determining institutional and participant information, as well as IPR management practices within TTOs.

Section 2: Includes 9 questions designed to identify the opportunities encountered in IPR practices in TTOs.

Section 3: Comprises 10 questions focused on identifying the challenges faced in these processes.

The validity and reliability of the study were supported by incorporating control questions (re-control) within the questionnaire. The form was created online via Google Forms, and the access link was shared with the participants. The questions were designed as multiple-choice, Likert-scale, and open-ended, with care taken to express them in simple, clear, and concise sentences. In the open-ended sections, participants were encouraged to describe any effective specialized methods they have developed for IPR management and commercialization, as well as specific opportunities and challenges TTOs encounter. The research was

designed to understand the IPR implementation processes and experiences of universities in depth.

2.4. Ethical Considerations

Ethical approval for the questionnaire used in this study (Decision Number 7) was obtained during the 3rd session of the Inonu University Social and Human Sciences Scientific Research and Ethics Committee, dated January 30, 2025.

The confidentiality of participant information was strictly maintained. It was explicitly stated at the beginning of the online questionnaire that the study was prepared solely for scientific purposes to collect data on the current state and demonstrate the impact of TTOs in university IPR management. Furthermore, participants were informed that the data would be used exclusively for scientific research and that participation was entirely on a voluntary basis.

2.5. Statistical Analysis

2.5.1. Quantitative Data Analysis

The quantitative data collected within the scope of the study were transferred to an electronic environment and organized using Microsoft Excel. The organized data were subsequently analyzed using the SPSS (Statistical Package for the Social Sciences) software, version 25.

In the descriptive statistical analysis, the frequency and percentage distributions of the data were calculated. To determine whether the number of national and international industrial property rights, as well as the total number of commercialized industrial property rights, followed a normal distribution, the Kolmogorov-Smirnov and Shapiro-Wilk values were examined.

Table 1: Normality Test Results.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Average Number of National Industrial Property Rights Managed Annually	,300	96	,000	,530	96	,000
Average Number of International Industrial Property Rights Managed Annually	,358	96	,000	,450	96	,000
Total number of commercialized industrial property rights.	,297	96	,000	,572	96	,000
a. Lilliefors Significance Correction,						

The values obtained for both the Kolmogorov-Smirnov and Shapiro-Wilk tests are presented in Table 1. Since the p-values are less than 0.05 ($p < 0.05$), it is concluded that the number of national and international industrial property rights, as well as the total number of commercialized industrial property rights, do not follow a normal distribution. Consequently, the Mann-Whitney U test, a non-parametric method, was utilized in this section (Bindak, 2014). To determine whether there is a significant difference between the rank means of two independent variables, the non-parametric Mann-Whitney U hypothesis test is used.

2.5.2. Qualitative Data Analysis

Section 1:

- Is there a specific effective method or practice you have developed for your university's IPR management? Could you provide a brief summary?
- What pathway do you follow in the commercialization of IPR?
- Please specify any particular issue you would like to highlight regarding IPR management at your TTO.

Section 2:

- In which areas not mentioned above does your TTO offer opportunities to your university regarding IPR activities?

Section 3:

- What challenges does your TTO encounter in conducting your university's IPR activities?

Thematic analysis was applied to the responses provided to the open-ended questions. Thematic analysis (TA) is a method of interpreting qualitative data by breaking it down into sub-themes and main themes, analyzing it, and interpreting it (Clarke and Braun, 2017). TA provides a highly effective qualitative approach, particularly for researchers conducting applied research—such as in certain healthcare studies—or research that transcends academic boundaries into policy or practice domains (Braun and Clarke, 2014).

A phased process was employed to categorize the data collected from open-ended questions into themes (Bowman, 2023). Initially, the researcher familiarized themselves with the data by reading and generating preliminary notes. Subsequently, the themes emerging from the data were coded. Upon analysis of the responses, the

primary themes and sub-themes were identified.

3. FİNDİNGS

3.1. Findings Regarding IPR Practices

Within the scope of the research, several questions were posed to identify practices regarding intellectual and industrial property rights (IPR) in universities. The responses to these questions are presented in Table 2. Of the 96 participants, 32 answered "Yes" to the question "Do you benefit from support mechanisms (projects) for IPR activities in your TTO?", while 64 responded "No". All 32 participants who responded affirmatively specifically stated that they utilize TÜBİTAK supports. Furthermore, a question was included to determine the employment status of personnel holding patent attorney, trademark attorney, or RTTP certification in IPR units; it was reported that 12.5% of the units employ patent attorneys, 5% employ trademark attorneys, and 12.5% employ RTTP-certified personnel. Additionally, 83% of the participants stated that they support the management of IPR processes by procuring services from external firms. Finally, participants indicated that the budgetary sources for university IPR activities consist of university budgets (approx. 80%), TTO budgets (13.5%), and a combination of both (approx. 6.5%).

Table 2: Practices Regarding Intellectual and Industrial Property Rights in Universities.

Questions/Answers	Frequency	Percent
Does your TTO benefit from IPR (Intellectual Property Rights) Support?		
Yes	32	33.3
No	64	66.7
Does your TTO employ a patent attorney?		
Yes	12	12.5
No	84	87.5
Does your TTO employ a trademark attorney?		
Yes	5	5.2
No	91	94.8
Does your TTO employ RTTP (Technology Transfer Professional) certified personnel?		
Yes	12	12.5
No	84	87.5
Does your university receive services from a firm while carrying out IPR activities?		
Yes	80	83.3
No	16	16.7
What is the budget source of your TTO?		
University Budget	77	80.2
TTO Budget	13	13.5
University-TTO Budget	6	6.3

As presented in Table 3, approximately 73% of the respondents indicated that there is "partial" awareness in response to the question, "Is there sufficient awareness regarding IPR among the employees, researchers, or students of your university?" Furthermore, regarding the question "Which academic group is the most active concerning IPR at your university?", approximately 41% of respondents identified Professors as the most active, followed by Associate Professors (29%), Assistant Professors (24%), and Research Assistants (approx. 6%).

Finally, in response to the question "Which student group is the most active regarding IPR at your university?", the participants reported that Doctoral (PhD) students are the most active group (~47%), followed by Bachelor's students (~28%) and Master's students (~25%).

Table 3: Data on IPR awareness and the most active groups in universities.

Questions/Answers	Frequency	Percent
Is there sufficient awareness of IPR among the staff, researchers, or students of your university?		
Yes	13	13.5
Partially	70	72.9
No	13	13.5
Which academic group is most active in IPR at your university?		
Prof. Dr.	39	40.6
Associate Professor Dr.	28	29.2
Assistant Prof. Dr.	23	24.0
Lecturer	0	0.0
Research Assistant	6	6.3
Which student group is most active in IPR at your university?		
Associate Degree Student	0	0.0
Undergraduate Student	27	28.1
Master's Degree Student	24	25.0
Doctoral Student	45	46.9

3.2. Findings Regarding Opportunities Offered by TTOs in IPR Management in Universities

In the second section of the questionnaire, questions were posed to understand the opportunities offered by technology transfer offices in the management of intellectual and industrial property rights (IPR) in universities. A 5-point Likert-type scale was employed for the responses in this section. Participants' level of agreement was measured as follows: 1 = Strongly No, 2 = No, 3 = Partially, 4 = Yes, and 5 = Strongly Yes.

In response to the statement, "TTOs raise awareness about IPR among university employees, students, and graduates," approximately 84% of the participants responded with "Yes" or "Strongly Yes." Furthermore, approximately 82% of the participants stated that university IPR management is conducted more systematically thanks to TTOs, while 74% indicated that TTOs provide guidance in the commercialization of academic knowledge alongside IPR management. Additionally, 82% of respondents noted that TTOs hold immense significance in transferring academic knowledge to industry through IPR.

Approximately 90% of participants stated that "Technology Transfer Offices provide support in protecting the outputs of academic work at the university through intellectual property rights. Approximately 89% of the participants stated that TTOs contribute to the university's performance indicators for index rankings through IPR activities and support the country's level of development through IPR management. Finally, approximately 78% of the participants indicated that the Turkish Patent and Trademark Office (TÜRKPATENT) conducts sufficient training, seminars, and similar activities aimed at increasing the capacity of TTO employees regarding IPR. In this section, the participants' agreement with the aforementioned statements was analyzed by considering the sum of "Yes" (4) and "Strongly Yes" (5) responses. The complete data for all statements are presented in Table 4.

Table 4: Opportunities Offered by TTOs in IPR Management in Universities.

Statements	**Absolutely not** (Frequency %)	**No** (Frequency/ %)	**Partially** (Frequency / %)	**Yes** (Frequency/ %)	**Absolutely yes** (Frequency / %)
The Technology Transfer Office (TTO) raises awareness about Intellectual Property Rights (IPR) among university staff, students, and graduates.	3 (%3.1)	5 (%5.2)	7 (%7.3)	26 (%27.1)	55 (%57.3)
Thanks to the TTO, the university's IPR management is carried out more systematically.	0 (%0.0)	13 (%13.5)	4 (%4.2)	12 (%12.5)	67 (%69.8)
The TTO provides guidance on the commercialization of academic knowledge in conjunction with IPR.	9 (%9.4)	4 (%4.2)	12 (%12.5)	22 (%22.9)	49 (%51)
TTOs are of great importance in transferring academic knowledge from the university to industry through IPR.	2 (%2.1)	4 (%4.2)	11 (%11.5)	26 (%27.1)	53 (%55.2)

TTOs provide support in protecting the outputs of academic work at the university through IPR.	0 (%0.0)	0 (%0.0)	9 (%9.4)	27 (%28.1)	60 (%62.5)
The TTO provides data for the performance indicators of the university's index studies through its IPR activities.	0 (%0.0)	6 (%6.3)	5 (%5.2)	28 (%29.2)	57 (%59.4)
TTOs contribute to the development level of our country through the IPR management of universities.	0 (%0.0)	4 (%4.2)	7 (%7.3)	28 (%29.2)	57 (%59.4)
The Turkish Patent and Trademark Office conducts sufficient training, seminars, etc., to increase the capacity of TTO employees in the field of IPR.	4(%4.2)	5 (%5.2)	12 (%12.5)	35 (%36.5)	40 (%41.7)

3.3. Findings Regarding Challenges Encountered by TTOs in IPR Management in Universities

In the third section of the questionnaire, questions were directed toward understanding the challenges faced by technology transfer offices in managing intellectual and industrial property rights (IPR) in universities. A 5-point Likert-type scale was utilized for the responses in this section. To determine the participants' level of agreement, responses were recorded as: 1 = Strongly No, 2 = No, 3 = Partially, 4 = Yes, and 5 = Strongly Yes. In this part, the analysis focused on the participants' agreement by considering the sum of "Yes" (4) and "Strongly Yes" (5) responses.

Approximately 81% of the participants stated that there are significant difficulties in the employment of IPR specialists within University TTOs. Furthermore, approximately 55% reported challenges in creating budgets for IPR activities, 67% encountered issues in the commercialization of IPR outputs, and 58% faced difficulties in the valuation of IPR-related products. About 38% of the participants indicated that they, as TTOs, experienced challenges in the legal management and contracting of industrial property rights. Additionally, approximately 68% of respondents noted difficulties in detecting invention applications made by university employees to the Turkish Patent and Trademark Office (TÜRKPATENT) without prior notification to the University/TTO. Finally, approximately 77% of the participants mentioned that employees assigned to IPR units initially began their roles without sufficient knowledge of the processes, specializing instead through their own efforts during their tenure. Furthermore, approximately 36% stated that the managers of their respective institutions or units do not prioritize capacity-building activities (such as training, seminars, and certification) for IPR unit employees. In this section, the participants' agreement with the aforementioned statements was analyzed by considering the sum of "Yes" (4) and "Strongly Yes" (5) responses. The complete data for all statements are presented in Table 5.

Table 5: Challenges Encountered in the Management of Intellectual and Industrial Property Rights in Universities.

Statements	**Absolutely not** (Frequency %)	**No** (Frequency/ %)	**Partially** (Frequency / %)	**Yes** (Frequency/ %)	**Absolutely** (Frequency / %)
We are experiencing difficulties in employing experts in Intellectual Property Rights (IPR) at the Technology Transfer Office (TTO).	2 (%2.1)	9 (%9.4)	7 (%7.3)	31 (%32.3)	47 (%49.0)
We are having trouble identifying invention applications made to the Turkish Patent Office by university employees without notifying the University/TTO.	11 (%11.5)	10 (%10.4)	10(%10.4)	35 (%36.5)	30 (%31.3)
We are experiencing difficulties in creating a budget for IPR activities at the TTO.	7 (%7.3)	18 (%18.8)	18(%18.8)	16 (%16.7)	37 (%38.5)

The managers of the institutions/units we work with do not prioritize capacity-building activities (training, seminars, certification, etc.) for IPR unit employees.	18(%18.8)	19 (%19.8)	24(%25)	27 (%28.1)	8 (%8.3)
As a TTO, we are experiencing difficulties in the commercialization of IPR outputs.	4 (%4.2)	6 (%6.3)	22(%22.9)	23 (%24)	41 (%42.7)
We are experiencing difficulties in the valuation of IPR products.	6 (%6.3)	12 (%12.5)	22(%22.9)	25 (%26)	31 (%32.3)
Employees working in IPR units at TTOs initially work without sufficient knowledge of the process. They become experts in this area through their own efforts.	6 (%6.3)	7 (%7.3)	9 (%9.4)	31 (%32.3)	43 (%44.8)
As a TTO, we are experiencing difficulties in the legal management and contracts of industrial property rights.	17(%17.7)	22 (%22.9)	21(%21.9)	30(%31.3)	6 (%6.3)

3.4. Comparison of Certain Variables According to IPR Numbers

The Mann-Whitney U test was applied to compare the mean ranks of the average annual number of national and international industrial property rights (IPR) managed, as well as the total number of commercialized industrial rights, based on the employment of patent attorneys, trademark attorneys, and RTTP (Registered Technology Transfer Professional) certified personnel within the participants' respective IPR units. According to the data presented in Table 6:It is observed that there is no statistically significant difference ($p > 0.05$) between the mean ranks of the average annual number of national/international industrial property rights managed and the total number of commercialized industrial rights based on the employment of patent attorneys in the IPR units. In contrast, there is a statistically significant difference ($p < 0.05$) between the mean ranks of the average annual number of national/international industrial property rights managed and the total number of commercialized industrial rights based on the employment of RTTP-certified personnel in the IPR units.

Table 6: Relationship between the annual number of managed and commercialized IPRs and the employment of patent attorneys and RTTP-certified personnel in IPR units.

	Employment of Patent Attorneys in TTOs	**n**	**Mean Rank**	**U**	**P**
Average Number of National Industrial Property Rights Managed Annually	Yes	12	47.88	496.500	0.934
	No	84	48.59		
Average Number of International Industrial Property Rights Managed Annually	Yes	12	54.21	435.500	0.446
	No	84	47.68		
Total number of commercialized industrial property rights	Yes	12	55.67	418.000	0.324
	No	84	47.48		
	Employment of RTTP Certified Personnel in TTOs	**n**	**Mean Rank**	**U**	**P**
Average Number of National Industrial Property Rights Managed Annually	Yes	12	66.08	293.000	0.019
	No	84	45.99		
Average Number of International Industrial Property Rights Managed Annually	Yes	12	70.83	236.000	0.003
	No	84	45.31		
Total number of commercialized industrial property rights	Yes	12	77.25	159.000	0.000
	No	84	44.39		

The Mann-Whitney U test was performed to compare the mean ranks of the average annual number of national and international industrial property rights (IPR) managed, and the total number of commercialized industrial rights, based on whether the universities outsourced the management of IPR applications, research, and process tracking to an external firm. According to the data presented in Table 7, it is observed that there is no statistically significant difference ($p > 0.05$) between the mean ranks of the average annual number of national/international IPRs managed and the total number of commercialized IPRs according to the status of procuring services from an external firm for these processes.

Table 7: Relationship between the annual number of managed and commercialized IPRs and the

outsourcing of services in IPR units.

	Procurement of services from companies for IPR	n	Mean Rank	U	P
Average Number of National Industrial Property Rights Managed Annually	Yes	80	50.11	511.500	0.205
	No	16	40.47		
Average Number of International Industrial Property Rights Managed Annually	Yes	80	48.88	609.500	0.763
	No	16	46.59		
Total number of commercialized industrial property rights	Yes	80	48.68	625.500	0.883
	No	16	47.59		

The Mann-Whitney U test was performed to compare the mean ranks of the average annual number of national and international industrial property rights (IPR) managed, as well as the total number of commercialized industrial rights, according to the utilization of IPR support mechanisms (projects) in the universities with which the participants are affiliated. According to the data presented in Table 8, a statistically significant difference ($p < 0.05$) was observed between the mean ranks of the average annual number of national/international IPRs managed and the total number of commercialized IPRs based on the status of utilizing IPR support mechanisms (projects).

Table 8: Relationship between the annual number of managed and commercialized IPRs and the utilization of IPR support programs in IPR units.

	Utilizing TTO Support Mechanisms	N	Mean Rank	U	P
Average Number of National Industrial Property Rights Managed Annually	Yes	32	61.31	614.000	0.001
	No	64	42.09		
Average Number of International Industrial Property Rights Managed Annually	Yes	32	63.88	532.000	0.000
	No	64	40.81		
Total number of commercialized industrial property rights	Yes	32	57.94	722.000	0.015
	No	64	43.78		

3.5. Findings Regarding Qualitative Data

The issue of commercializing university inventions is particularly evident today. Regarding the open-ended question, "What pathway do you follow in the commercialization of IPR?", approximately 54% of the 96 participants provided responses. The majority of these respondents stated that they conduct their commercialization activities by taking Technology Readiness Levels (TRL) into account and with the support of the university-industry collaboration (UIC) unit. Furthermore, some participants reported having developed a specialized hybrid method for commercialization by utilizing valuation methods and receiving support from intermediary organizations.

In response to the open-ended question, "Is there a specific issue you would like to highlight regarding IPR management at your TTO?", 25% of the participants provided answers. Additionally, about 67% of the participants responded to the question, "What challenges does your TTO encounter in conducting your university's IPR activities?" The responses to these two questions were remarkably similar, with most participants highlighting the difficulties and bottlenecks faced in IPR management within TTOs. For the question regarding specific issues in IPR management, respondents noted challenges such as the difficulty in finding qualified personnel, barriers to commercialization, a lack of institutionalization, and insufficient collaboration between TTOs. For the question concerning the challenges in conducting IPR activities, similar yet more frequently cited issues were identified, including personnel shortages, difficulties in budgeting and IPR commercialization, insufficient awareness of TTOs and IPR processes, and prolonged process tracking in joint inventions.

Approximately 21% of the participants responded to the question, "In which areas not mentioned above does your TTO offer opportunities to your university regarding IPR activities?" Most of these respondents emphasized that IPR processes are managed more systematically within the TTO and that universities avoid the loss of rights concerning IPR thanks to TTOs. They also mentioned that TTOs facilitate involvement in various projects related to IPR and that IPR activities generate tangible outputs for university-industry collaboration (UIC) activities.

3.6. Limitations of the Study

The limitations of this study are consistent with those found in similar research within this field. These limitations include:

- The research is restricted to the specific individuals who chose to participate on a voluntary basis.
- The study is geographically and contextually focused solely on the Intellectual and Industrial Property Rights (IPR) and Technology Transfer Office (TTO) sectors in Türkiye.
- The scope of the research is confined to the

predefined questions within the survey instrument.
- It is assumed that all participants accurately perceived and responded to the items in the questionnaire truthfully and consistently.

4. DISCUSSION AND CONCLUSION

The most crucial aspect distinguishing this study from existing literature is that it was conducted using data collected specifically from "Industrial Property Consultants" of the Turkish Patent and Trademark Office (TÜRKPATENT), who hold both competence and authority in the field of Intellectual and Industrial Property Rights (IPR) within universities. Consequently, this research provides a robust framework for understanding IPR practices, challenges, and opportunities in universities, as well as the strategic importance of Technology Transfer Offices (TTOs), based on insights from domain experts. Historically, the majority of researchers in academia utilized their work primarily for academic promotion. Today, however, the commercialization of academic research, its contribution to social welfare, and its transfer to industry have become more prominent (Baglieri et al., 2018). The consolidation of generated knowledge and technology under a single institutional roof, and its subsequent transformation into application, commercialization, or productivity, is now of paramount importance. In this context, TTOs play a vital role, with each office developing various methodologies to conduct their activities more efficiently (Değerli and Tolon, 2006).

Regarding the commercialization of academic work, the primary concern for researchers is the risk of imitation or theft of their intellectual labor. Therefore, IPR is critical for the protection of inventions arising from academic studies. TTOs or related units within universities manage the entire process, starting from the invention disclosure by faculty members, researchers, or students. Thus, TTOs serve as a cornerstone in this ecosystem. Analysis reveals that while TTOs share common practices and challenges, they also encounter unique opportunities based on their institutional structures.

TTOs raise awareness among university employees, students, and graduates regarding IPR and ensure that activities are conducted more systematically. They serve as guides for the protection of academic knowledge, its transfer to industry, and particularly the commercialization of IPR outputs. Existing literature supports these findings; for instance, Çatal (2024) emphasizes the importance of TTOs in facilitating technology transfer to the sector, while Saragossi and van Pottelsberghe (2003) highlight that TTOs are effective in increasing the propensity to patent. Furthermore, TTO activities provide the necessary data for universities and academics to achieve rankings in local and global indices, thereby supporting institutional development levels. Consequently, TTOs are of immense importance for university IPR activities, a view echoed by Goldfarb and Henrekson (2003), Young (2007), and Geuna and Nesta (2006), who noted their efficacy in commercialization, and Güler (2018), who highlighted their role in national development.

However, TTOs face significant challenges in the employment of specialists, particularly in IPR units that require specialized knowledge. It was observed that most IPR unit employees in Turkish universities lack sufficient initial knowledge when they first assume their roles. To address this, TÜRKPATENT—which governs industrial property transactions in Türkiye according to relevant legislation—has established "Industrial Property Information Units" to monitor, inform, and guide the protection of university inventions. The Office provides these consultants with sufficient training, seminars, and meetings, thereby contributing to the capacity building of unit employees. Such specialized teams enable TTOs to operate more effectively (Macho-Stadler, 2007). Nevertheless, many IPR units still struggle with budgeting because they cannot yet perform IPR valuation or generate sufficient income through commercialization. Additionally, detecting invention applications made directly to TÜRKPATENT by university employees without notifying the University/TTO remains a significant challenge.

The Registered Technology Transfer Professional (RTTP) designation is awarded by the Alliance of Technology Transfer Professionals (ATTP) and represents an international standard of professional competence and experience. As of November 2020, there were more than 600 RTTP-titled experts worldwide. To earn this title, specialists undergo a series of rigorous training and development pathways. This mechanism encourages experts to demonstrate dedicated work and serves as a beneficial incentive for career goals (ÜSİMP, 2026). Our study demonstrates that the employment of RTTP-titled personnel in university IPR units correlates with an increase in the annual number of managed national and international industrial rights and the total number of commercialized rights. Encouraging and guiding employees in all IPR units in Türkiye toward obtaining RTTP certification would likely support more efficient and effective

outcomes for universities.

Since many universities in Türkiye cannot employ full-time patent attorneys, they procure support services from external firms for IPR applications and research. This outsourcing eases the workload of unit employees and facilitates knowledge and experience sharing with patent attorneys. Furthermore, as the utilization of IPR support mechanisms (such as projects) increases, the annual number of industrial property rights and commercialization activities also rises. According to our data, the most common of these support mechanisms is TÜRKİTAK (The Scientific and Technological Research Council of Türkiye).

Finally, the qualitative analysis of open-ended questions mirrored and reinforced the quantitative findings. Beyond the closed-ended responses, participants highlighted that institutionalization in TTOs is still insufficient and that inter-TTO collaboration needs further development. Regarding commercialization pathways, participants noted that they consider Technology Readiness Levels (TRL), maintain contact with intermediary organizations having expert teams, and operate in tandem with the UIC (University-Industry Collaboration) modules. The research also identified universities that utilize specialized hybrid methods combining multiple commercialization strategies. Lastly, a significant finding is the time loss experienced in joint applications due to delays in ownership decisions among partners.

5. RECOMMENDATIONS

Based on the findings of this research, the following recommendations are proposed to enhance the effectiveness of Technology Transfer Offices (TTOs) and Intellectual/Industrial Property Rights (IPR) management in universities:

Raising Strategic Awareness: University administrations should actively engage in activities to increase the visibility and strategic importance of TTOs. Enhancing institutional awareness is crucial for fostering a culture of innovation across all academic levels. Prioritizing Capacity-Building: Decision-makers should prioritize capacity-building initiatives for TTO staff. By investing in the professional development of these units, universities can contribute highly qualified human capital to the national innovation ecosystem. Specialized Training Programs: More intensive training, seminars, and mentoring programs specifically focused on IPR valuation and commercialization strategies should be organized. Providing staff with these specialized skills is essential for bridging the gap between invention and market entry. Thematic Working Groups: Universities should consider establishing small, niche working groups or specialized units focused on specific thematic areas within IPR. This granular approach can lead to more expertise-driven process management. Incentivizing RTTP Certification: Employees within IPR units in Türkiye should be incentivized and provided with institutional support to obtain the Registered Technology Transfer Professional (RTTP) certification. Establishing RTTP as a standard for competency will significantly elevate the quality of outputs. Broadening Support Program Utilization: Beyond IPR management, events and internal mechanisms should be designed to ensure that TTOs benefit more extensively from various support programs across all their functional modules.

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