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MULTICRITERIA APPROACH TO PRIORITIZE STRATEGIC GOALS: CASE OF A PUBLIC UNIVERSITY

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Abstract

This research aims to enhance the strategic planning process in public organizations, more specifically universities by suggesting two prioritization approaches using Multiple Criteria Decision Making (MCDM) methods, considering the case of Ankara University (AU), a Turkish public university. Performing an independent analysis of goals, the first approach involves an application of AHP to get the goals' importance weights, which in turn are used as the input of a three-scenario based TOPSIS application along with the goals' anticipated costs. The second approach follows an influence-based perspective to highlight the degree of interdependence of university goals and the need for a balanced solution to strategic planning. DEMATEL is thence employed to further explore the causal relationships between these goals. Then, the influence weights are incorporated along with AHP importance weights and the anticipated costs as the input of another TOPSIS application. Although the first approach generates significant insights to decision makers (DMs) as it prioritizes strategic goals based on their importance to AU and their budgets, the second approach provides a deeper analysis and an advanced prioritization model. DMs can therefore select the approach that works best for them in terms of needs and data. This study can help AU and similar institutions prioritize their strategic goals, efficiently allocate resources, and enhance their overall strategic performance. The study also demonstrates the effectiveness of MCDM methods in strategic planning and provides valuable insights for future research in this area.

Keywords: Strategic planning, AHP, TOPSIS, DEMATEL, criteria importance, influence

Stratejik Hedeflerin Önceliklendirilmesine Yönelik Çok Kriterli Yaklaşım: Bir Devlet Üniversitesi Örneği

Öz

Bu araştırma, kamu kurumlarında ve özellikle üniversitelerde stratejik planlama sürecini geliştirmeyi amaçlamakta olup, Ankara Üniversitesi (AÜ) örneği üzerinden Çok Kriterli Karar Verme (ÇKKV) yöntemleri kullanılarak iki önceliklendirme yaklaşımı önermektedir. İlk yaklaşımda, hedeflerin bağımsız analizi gerçekleştirilmekte ve Hiyerarşi Analizi Süreci (AHP) uygulanarak hedeflerin önem ağırlıkları elde edilmektedir. Bu ağırlıklar, hedeflerin tahmini maliyetleriyle birlikte üç senaryoya dayalı bir TOPSIS uygulamasına girdi olarak kullanılmaktadır. İkinci yaklaşım ise, üniversite hedeflerinin karşılıklı bağımlılık düzeyini ve stratejik planlama için dengeli bir çözümün gerekliliğini vurgulayan etki temelli bir bakış açısını benimsemektedir. Bu doğrultuda, DEMATEL yöntemi kullanılarak hedefler arasındaki nedensel ilişkiler derinlemesine incelenmektedir. Ardından, etki ağırlıkları AHP'den elde edilen önem ağırlıkları ve tahmini maliyetlerle birlikte başka bir TOPSIS uygulamasına entegre edilmektedir. İlk yaklaşım, stratejik hedefleri Ankara Üniversitesi açısından önem dereceleri ve bütçeleri temelinde önceliklendirerek karar vericilere (KV'ler) anlamlı içgörüler sunarken; ikinci yaklaşım, daha kapsamlı bir analiz ve gelişmiş bir önceliklendirme modeli sağlamaktadır. Böylelikle KV'ler, ihtiyaçlarına ve mevcut veriye en uygun yaklaşımı tercih edebilmektedir. Bu çalışma, AÜ ve benzeri kurumların stratejik hedeflerini önceliklendirmelerine, kaynaklarını etkin biçimde tahsis etmelerine ve genel stratejik performanslarını artırmalarına katkı sağlayabilir. Ayrıca, ÇKKV yöntemlerinin stratejik planlamadaki etkinliğini ortaya koymakta ve bu alandaki gelecek araştırmalar için değerli içgörüler sunmaktadır.

Anahtar Kelimeler: Stratejik planlama, AHP, TOPSIS, DEMATEL, kriter önemi, etki düzeyi

1. Introduction

Organizations typically formulate strategic plans aligned with their overarching vision to enhance their operational efficiency and effectiveness in short and long terms in order to stay competitive (Ramirez, 2024; Kaplan & Norton, 2001a; Kaplan & Norton, 2001b). Each organization operates within its unique framework, characterized by distinct identity, working styles, constraints, weaknesses, and strengths. Accordingly, management teams, experts and board members collaborate to develop a strategic roadmap for future endeavours (Arnwine, 2002), along with a set of key performance indicators (KPIs) that serve as benchmarks for monitoring progress and assessing the level of achievement against strategic objectives and goals (del-Rey-Chamorro et al., 2003; Bhatti et al.,2013; Setiawan & Purba, 2020). The assessment process is inherently complex and requires a scientific approach to ensure an accurate evaluation of the organizational performance (Lusthaus et al., 1999). Therefore, establishing a robust appraisal system necessitates formulating SMART goals, as well as developing consistent, coherent, and precise KPIs, along with scientifically validated methodologies

to calculate these indicators (Bjerke & Renger, 2017).

However, beyond assessment lies the critical phase of goal prioritization, which is paramount for all organizations due to the fundamental constraint of budget allocation (Phillips & Costa, 2007). Every organization functions within a predetermined budget framework, where specific budgets are allocated to individual objectives and goals, with strict adherence to financial constraints (Frow et al., 2010). Consequently, alongside the strategic planning process, organizations must implement a prioritization model to establish a clear roadmap and gain insights into the most critical goals that require immediate attention to enhance overall performance and achieve greater success in other areas (Wu, 2012). This is particularly crucial as certain goals may be interdependent or interconnected, the progress in one area may facilitate or hinder progress in another (Quezada et al., 2018).

Despite its significance, the prioritization phase is often overlooked, particularly in public organizations, where strategic plans are typically formulated in response to government directives to secure the necessary budgetary allocations (Nartisa et al., 2012). Previous research (Mtau & Rahul, 2024; Betty & Nkechi, 2023; Abdalkrim, 2013) has predominantly focused on private organizations, which have greater flexibility in developing new KPIs and assessment models. Conversely, public organizations often adhere to standardized indicators and assessment systems mandated by governments; often relying on outdated methodologies (Bird et al., 2004). This paper seeks to address this gap by proposing a set of prioritization models based on hybrid Multiple Criteria Decision Making (MCDM) methods to assist public organizations in efficiently prioritizing their strategic goals. While existing works have primarily focused on public for-profit entities, this research focuses on public universities, with Ankara University (AU) serving as the case study for this investigation.

2. Literature Review

2.1. Strategic Planning

Strategic planning serves as a fundamental pillar that supports strategic management. Defined as the art of maximizing organizational potential to achieve objectives, strategic management refers to the process in which goals are set, strategies are formulated, and efforts are made to achieve organizational objectives (Bryson, 2018; Bryson et al., 2017). It provides guidance, direction, and boundaries for operational management, emphasizing the critical role of strategic planning in boosting effectiveness and efficiency (Ramirez, 2024). It entails organizing qualitative and quantitative information to make effective decisions amidst varying levels of uncertainty. Strategic planning itself refers to all the disciplined efforts made to define and shape the organization's direction, priorities, and actions to meet the long-term vision (Bryson et al., 2017). It consists of three key stages: strategy formulation, strategy

implementation, and strategy evaluation (Nasab & Milani, 2012).

In the realm of higher education, many universities, both public and private, have embraced strategic planning to avoid loss in time, finances, and reputation (McCaffery, 2013). Universities design strategic plans to enhance the quality and innovation of their educational services, ensure continual development, guarantee competitive positioning against national and international counterparts, and attract prospective students (Hunt, 2011). Strategic plans usually encompass strategies and their corresponding objectives, along with a set of performance indicators (Bryson, 2018). Assessing objectives against their related indicators is essential to gauge the progress toward achieving strategic goals and test the effectiveness of strategies. While intuitive assessments rely on the expertise and acumen of decision makers (DMs), employing advanced scientific methods for evaluation can ensure the allocation of institutional resources to the most impactful goals, thereby enhancing the likelihood of strategy realization. This process is often recognized as a multi-criteria decision-making problem (Esfandiari & Rizvandi, 2014).

2.2. The Use of MCDM in Strategic Planning

MCDM is a crucial branch of decision science widely applied in comparing finite sets of alternatives or scenarios (Eshlaghy & Homayonfar, 2011). It grabbed the attention of several researchers, especially in management and planning fields, as it is capable of addressing multiple, often conflicting, decision criteria (Buyukozkan & Ersoy, 2009; Stojčić et al., 2019). It involves various methods and procedures, which employ different approaches; yet, they typically have the same goal of ranking a set of alternatives. MCDM models require weighting criteria according to their relative importance, aiming to help DMs integrate objective measurements with subjective judgments (Sahoo & Goswami, 2023).

Previous works have effectively utilized Analytic Hierarchy Process (AHP) for different strategic planning problems (Zyoud & Fuchs-Hanusch,2017) such as setting priorities (Cheng & Li, 2001), choosing the best among alternatives (Mahmudova & Jabrailova, 2020), allocating resources (De Marinis & Sali, 2020), optimizing processes (Elshafei et al., 2022), planning (Spanidis et al., 2021), prioritizing strategic goals (Özdemir et al., 2021) and performance measures (Vachnadze, 2016), and ranking faculties and universities (Kianypoor et al., 2024; Wu et al., 2012).

Others have used Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), introduced by Hwang and Yoon (1981), for their strategic planning problems. For instance, Esfandiari and Rizvandi (2014) employed this method to rank five business development strategies to improve the information technology system. Dodangeh et al. (2010) developed a model using TOPSIS combined

with Goal Programming to select and rank strategic plans in Balanced Scorecard. Mohamad et al. (2015) suggested a strategic planning procedure employing SWOT-TOPSIS, incorporating the reliability factor, to rank the strategic options and prioritize the factors in each SWOT category, giving the example of a local authority in Malaysia.

Decision Making Trial and Evaluation Laboratory (DEMATEL) is also one of the widely used methods in similar strategic contexts including quality control (ÇeliK & Arslankaya, 2023), sustainable development evaluation (Kao et al., 2022), healthcare management (Li et al., 2021) and strategic planning (Acuña-Carvajal et al., 2019; Quezada et al., 2022).

Due to the presence of multiple criteria influencing the decision outcomes in the strategic planning process, applying the aforementioned methods can thus offer effective tools, aiding in the development of reliable long-term plans (Bhole, 2018). AHP, for instance, provides a structured framework by decomposing strategic goals into hierarchical levels and assigning reliable importance weights to them. TOPSIS generates a clear numerical ranking for each alternative and offers DMs the chance to include multiple criteria in the evaluation, even weightings derived from other MCDM methods. DEMATEL, on the other hand, uncovers causal relationships and captures the interdependencies among goals, offering visual representations that allow DMs to better understand the dynamics of the system. Therefore, by triangulating insights from these three methods, numerical rankings alongside causal maps are provided, facilitating informed and transparent decision making for university administrators. This hybrid approach aims to capitalize on the strengths of different methods while mitigating their individual limitations, leading to more robust and accurate decision outcomes.

3. Methodology

3.1. Case Study

This study endeavors to devise a prioritization framework for ranking the strategic objectives and goals within public institutions, notably universities. This research hence takes Ankara University under the loop. AU, established in 1946[1], is the first public institute of higher education in the modern Turkish Republic. It is located in Ankara, the capital city of Türkiye. The university has a diverse student body, with a total enrollment that exceeds 78,000[2] students in 2024. AU is home to a wide range of faculties, including faculties of medicine, law, engineering, humanities, and social sciences, among others. It offers undergraduate, graduate, and doctoral programs in various fields of study. The university holds

[1]https://www.ankara.edu.tr/kurumsal/tanitim/tarihce
[2]https://oidb.ankara.edu.tr/wp-content/uploads/sites/91/2022/11/TABLO1.pdf

a prominent position both locally and internationally especially in the research field.

It is mandated to operate under the oversight of the Turkish government. Every five years, AU, like any other public university, is required to develop a comprehensive strategic plan outlining its future objectives, goals, and corresponding budget allocations. Additionally, it is asked to adhere to a set of predetermined KPIs to evaluate its performance in achieving these strategic objectives. Following approval from relevant government bodies, the university publishes its strategic plan on its website, ensuring accessibility to all stakeholders as part of its commitment to social inclusion, transparency, and accountability.

3.2. Data

The main data source for this study consists of secondary data extracted from AU's strategic plan for the years 2024-2028[3]. This strategic planning report is publicly available and is disseminated by the university on its official website. The dataset includes the strategic goals and objectives established for the specified period, the corresponding KPIs for each objective and their relative importance weights. AU has identified five overarching goals for the forthcoming years:

Goal 1: To conduct qualified research at national and international standards and to ensure that research outputs are transformed into value
Goal 2: To educate individuals who can express themselves effectively in both national and international contexts, possess the information literacy and problem-solving skills required by the current era, and contribute to enhancing the productivity of academic staff
Goal 3: To effectively use the scientific capacity of the university in line with the needs of the society
Goal 4: To increase the entrepreneurship capacity of the institution and enrich institutional collaborations
Goal 5: To strengthen the institutional structure by ensuring effective data management and self-assessment processes

3.3. Methods

3.3.1. Approach I: AHP-TOPSIS hybrid application

This approach involves an independent analysis of goals, integrating AHP with TOPSIS, as illustrated in Figure 1. Initially, AHP is employed to analyze the decision problem, with the resultant data serving

[3]http://sgdb.ankara.edu.tr/stratejik-planlar-2/

as input for the subsequent TOPSIS application. Developed by Saaty (1980), AHP is particularly useful in addressing decision-making challenges under uncertain conditions by considering multiple evaluation criteria (Stojčić et al., 2019). Its primary aim is to provide DMs with a reliable framework for informed decision-making, thereby mitigating the risks associated with incorrect choices (Franěk & Kresta, 2014). By deconstructing the decision problem into a hierarchical structure of smaller, more manageable sub-problems, AHP allows for independent assessment of each sub-problem, which helps minimize potential errors (Canco et al., 2021).

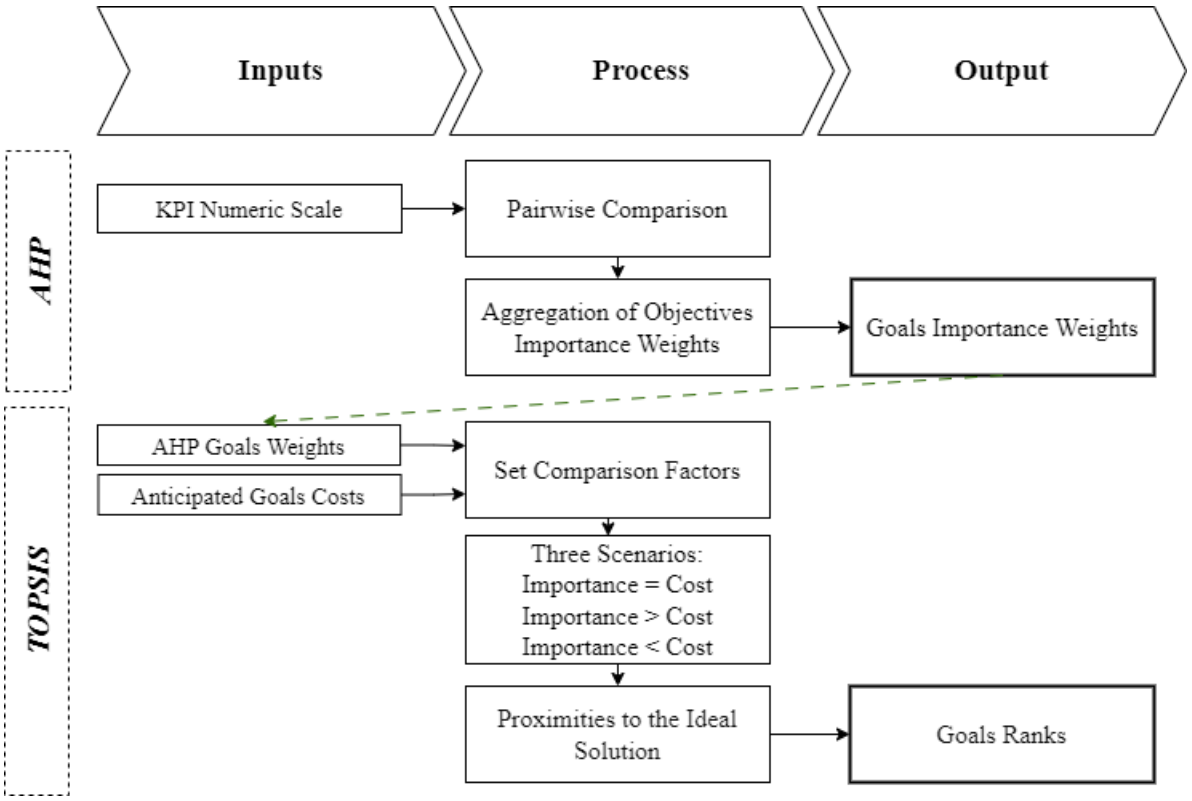

Figure 1: Steps of Approach I

To derive the global weights for AHP goals, several steps are undertaken. Given the data limitations inherent in AU's strategic plan report, a backward reasoning approach within the framework of MCDM is employed. This methodology involves progressing from the local importance weights of KPIs to ascertain weights for broader objectives, ultimately leading to the evaluation of overall goals. The weights of KPIs are compared against one another, focusing not on their actual values, but rather on the differences in local importance weights relative to one another. The swing weighting method is employed to assign scores for pairwise comparisons based on the magnitude of differences between KPIs, with these scores reflecting the relative importance or preference of one KPI over another. Numeric scores are assigned in accordance with the Saaty scale (1980), as detailed in Table 1, facilitating the pairwise comparisons.

Table 1: AHP Scale

KPIs' differences	Saaty scale	Definition
[0,4.99%]	1	Equal importance
]4.99%,9.99%]	2	Weak or Slight
]9.99%,14.99%]	3	Moderate importance
]14.99%,19.99%]	4	Moderate Plus
]19.99%,24.99%	5	Strong importance
]24.99%,29.99%]	6	Strong Plus
]29.99%,34.99%]	7	Very Strong
]34.99%,39.99%]	8	Very, very strong
] 39.99%, +	9	Extreme Importance

AHP process involves five key steps: first, a pairwise comparison matrix is created for the 89 KPIs, as outlined in formula (1); second, the matrix is normalized, following formula (2); third, global scores for each KPI are calculated using formula (3); fourth, a consistency check is conducted by calculating the consistency index as described in formula (4); and the consistency ratio is determined using formula (5) to validate the accuracy of the outcomes (Saaty, 1990). The resulting global weights are then aggregated for each KPI group to establish the importance weights for their corresponding objectives. Similarly, the scores for each group of objectives are consolidated to derive the importance weights for their related goals.

$$\mathrm{A_{ij}} = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix} \quad (1)$$

$$N_{ij} = \frac{A_{ij}}{\sum_{i=1}^{n} \mathrm{A_{ij}}} \quad (2)$$

$$W_i = \frac{\sum_{j=1}^{n} \mathrm{N_{ij}}}{n} \quad (3)$$

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (4)$$

$$CR = \frac{CI}{RI} \quad (5)$$

Following the AHP analysis, the TOPSIS method is implemented. TOPSIS is advantageous compared to other basic MCDM techniques, as it adeptly handles complex decision-making scenarios and

accommodates a wide array of criteria (both subjective and objective) while integrating importance weights seamlessly (Esfandiari & Rizvandi, 2014; Vavrek et al., 2021). For successful application of TOPSIS, it is essential that attribute values are numeric, exhibit monotonic behavior (either non-increasing or non-decreasing), and possess comparable units (Das & Kumar, 2023). In this context, TOPSIS is utilized to amalgamate the importance weights and associated costs into a single model, enabling the prioritization of goals based on these two factors. TOPSIS calculates the proximity of each goal to the positive and negative ideal solutions using formulas (6) and (7), respectively, followed by the calculation of performance index (PI) values as displayed in formula (8) for ranking purposes (Papathanasiou & Ploskas, 2018).

$$S_i^+ = \sqrt{\sum_{j=1}^{n} \left(\mathcal{V}\mathrm{ij} - \mathrm{A}_\mathrm{j}^+\right)^2} \tag{6}$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} \left(\mathcal{V}\mathrm{ij} - \mathrm{A}_\mathrm{j}^-\right)^2} \tag{7}$$

$$P_i^* = \frac{S_i^-}{S_i^+ + S_i^-} \tag{8}$$

These steps are executed across three distinct scenarios. In the first scenario, TOPSIS is performed with equal weights assigned to both criteria, with each receiving a weight of 0.5. In the second scenario, it is posited that DMs place greater emphasis on the importance of goals for the implementation of the strategic plan, assigning a weight of 0.75 to goal importance and 0.25 to cost. This weight distribution indicates a deliberate consideration that the importance of goals is three times more significant than their associated costs. This structured approach, facilitated by AHP, ensures consistency and provides a clear rationale for the assigned weights. Conversely, in the final scenario, a higher weight is allocated to goal costs, reflecting the assumption that these costs are more critical in comparisons than goal importance, with weights set at 0.75 and 0.25, respectively.

Providing three scenarios in this application is intended to highlight the flexibility of the prioritization model. The relative importance assigned to criteria can vary across mandates, universities, or even countries. DMs have the choice to adjust these criteria according to their institution's needs, strategic priorities, management vision, relevant national or ministry policies, and budgetary constraints. For instance, in a richer and more developed country, achieving strategic goals may be prioritized over minimizing costs, making the second scenario the most appropriate. Conversely, under strict budgetary or financial constraints, the third scenario is preferable, as it emphasizes goal costs more heavily

relative to their importance. DMs of the same institution can also make different prioritization assignments to goals across different strategic planning periods. For example, during periods of economic contraction when austerity measures are implemented, cost criteria may be given greater importance, while during periods of expansion or prosperity, the institution may prioritize criteria that would foster greater progress and expansion.

3.3.2. Approach II: AHP-DEMATEL-TOPSIS hybrid application

In systems characterized by high interdependence, where all criteria are interconnected, any modification in one criterion can influence all others, blocking AHP's ability to produce a robust prioritization model. DEMATEL effectively addresses this challenge by providing a systematic method for analyzing complex interrelationships within a system (Wang et al., 2012). This method serves as a valuable tool for transforming the causal relationships between criteria into a coherent structural model (Zolfani & Ghadikolaei, 2013). By facilitating a clearer understanding of these relationships, DEMATEL enhances decision-makers' ability to make informed and effective choices (Si et al., 2018). The second approach distinguishes itself from the first by employing DEMATEL method to elucidate the interdependencies among goals. In this framework, DEMATEL is utilized in conjunction with the AHP and TOPSIS, as shown in Figure 2.

In this approach, an expert from AU was consulted to evaluate the interdependencies of goals using the comparison scale presented in Table 2. The expert has more than 20 years of combined experience in academic and administrative roles at AU and has worked across different mandates, providing extensive knowledge of the university’s strategic context. While integrating multiple expert perspectives is generally recommended for comprehensive judgment (Chen et al., 2023), this study relies on a single expert to illustrate a practical application for Ankara University. This exercise is purely illustrative and not intended for adoption; it aims to provide DMs with novel tools for future strategic planning.

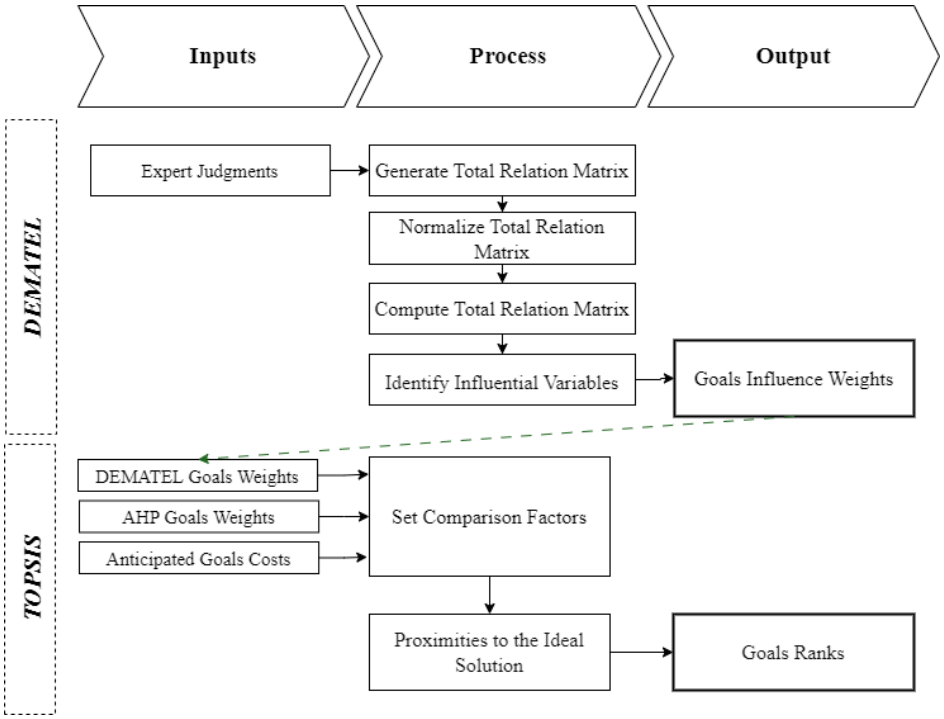

Figure 2: Steps of Approach II

The process begins by generating a direct relation matrix as displayed in (9), which reflects the interactions among the five goals (n=5). The influence of each goal in the rows is assessed in relation to the goals in the columns of this matrix. To normalize the matrix, the sum of all rows and columns is first calculated. The largest value among these sums, denoted as k, the latter is then identified as in formula (10). Each element of the direct-relation matrix is subsequently divided by k to achieve normalization as described in formula (11). The total relation matrix is then computed as described in formula (12), and a threshold value is established.

Subsequently, the final output is produced, and a causal diagram is constructed. This step includes calculating the sums of each row (D) and column (R) as denoted in fourmulas (13) and (14), respectively. The calculations of D+R and D−R are then performed, where D+R indicates the overall importance of goal i within the system, and D−R reflects the net effects contributed by goal i (Du & Li, 2021).

Table 2: DEMATEL Comparison Scale

Scale	**Definition**
0	No influence
1	Very low influence
2	Low influence
3	High influence
4	Very high influence

Finally, the influence weights of the goals are derived. The mathematical steps in this process are represented as follows:

$$\mathrm{X} = \begin{bmatrix} 0 & \cdots & x_{n1} \\ \vdots & \ddots & \vdots \\ x_{1n} & \cdots & 0 \end{bmatrix} \tag{9}$$

$$\mathrm{k} = \max\left\{ \max \sum_{\mathrm{j}=1}^{\mathrm{n}} \mathrm{x_{ij}}, \sum_{\mathrm{i}=1}^{\mathrm{n}} \mathrm{x_{ij}} \right\} \tag{10}$$

$$N = \frac{1}{k} * X \tag{11}$$

$$\mathrm{T} = \mathrm{N} \times (I - N)^{-1} \tag{12}$$

$$D = \sum_{j=1}^{n} T_{ij} \tag{13}$$

$$R = \sum_{i=1}^{n} T_{ij} \tag{14}$$

Finally, a subsequent TOPSIS application is performed to integrate the results obtained from the AHP and DEMATEL methods. This application aims to determine whether incorporating the interrelationships among goals leads to any changes in the ranking of these goals. Therefore, the analysis considers not only the importance and costs of the goals but also their interdependencies. The resulting influence weights are treated as a new comparative factor. In this instance, TOPSIS is executed with equal weights assigned to the three factors, each receiving a weight of 0.33. The outcomes of this model are then compared to those from the first approach of the initial TOPSIS application to assess any variations in the rankings.

4. Findings of Approach I

4.1. Findings of AHP

The goals importance scores indicate the relative weight of each one of them in the overall strategic plan. Those with higher scores are considered more important. Accordingly, results emphasize prioritizing Goals 2 and 5, ranking 1 and 2, respectively. This suggests that these two goals should receive significant attention and resources in the strategic planning process. On the other hand, Goal 3 is the least important amongst the others. Findings of AHP application on the goals level are displayed in Table 3. Objectives level AHP findings are also provided in Appendix, in Table A1. It is noteworthy

that the AHP results include a CR of 0.084159, which is below the threshold of 0.1 (Saaty, 1990). This indicates an acceptable level of consistency of the AHP analysis. The results suggest that AU can confidently use the findings to inform its strategic planning process to focus its efforts on the most critical areas, leading to more effective strategic planning and goal achievement.

Table 3: Goals Level AHP Findings

Goals	Importance	Rank
Goal 1	0.1800	4
Goal 2	0.2438	1
Goal 3	0.1151	5
Goal 4	0.2212	3
Goal 5	0.2398	2

4.2. Findings of Scenario-Based TOPSIS

As has been mentioned, three scenarios are performed with TOPSIS. In each scenario, the weights of the factors, i.e. goals importance and anticipated costs, are modified systematically to analyze the changes within the ranking. In the first scenario, where both factors are equally significant for DMs, Goal 1 has the highest performance index, followed by Goal 4 and Goal 3, as seen in Table 4. Conversely, Goal 3 is considered the least significant within the strategic plan. However, in the second scenario, where the goals importance is given a higher weight (i.e. 0.75) than cost (i.e. 0.25), changes in the ranking results are noticed. For instance, the goals to be prioritized are Goal 4, followed by Goals 5 and 1. However, Goals 3 and 2 remained at the same ranks but with variations in their performance indexes, as displayed in Table 5. In the last scenario, where goals' costs are given much importance (i.e. 0.75), Goal 4, followed by Goals 1 and 5 are the ones to be prioritized, as shown in Table 7. If DMs are more concerned about the budget than the outcomes of the strategic goals, they should shift their attention to the latter and not focus on Goals 3 and 2.

Table 4: AHP-TOPSIS Findings – Scenario 1

Goals	Importance	Cost	SI+	SI-	Pi	Rank
Goal 1	0.0900	0.0092	0.0325	0.2271	0.8748	1
Goal 2	0.1219	0.2340	0.2638	0.0644	0.1961	4
Goal 3	0.0575	0.1907	0.1992	0.0433	0.1784	5
Goal 4	0.1106	0.0029	0.1107	0.2371	0.6817	2
Goal 5	0.1199	0.0632	0.1356	0.1818	0.5728	3

Table 5: TOPSIS Findings – Scenario 2

Goals	Importance	Cost	SI+	SI-	Pi	Rank
Goal 1	0.1350	0.0046	0.0479	0.1225	0.7188	3
Goal 2	0.1828	0.1170	0.1155	0.0965	0.4552	4
Goal 3	0.0863	0.0954	0.1347	0.0216	0.1384	5
Goal 4	0.1660	0.0015	0.0169	0.1403	0.8926	1
Goal 5	0.1799	0.0316	0.0303	0.1267	0.8070	2

Table 6: TOPSIS Findings – Scenario 3

Goals	Importance	Cost	SI+	SI-	Pi	Rank
Goal 1	0.0450	0.0138	0.0185	0.3376	0.9480	2
Goal 2	0.0609	0.3509	0.3466	0.0322	0.0850	5
Goal 3	0.0288	0.2861	0.2835	0.0649	0.1862	4
Goal 4	0.0553	0.0044	0.0056	0.3476	0.9841	1
Goal 5	0.0600	0.0948	0.0904	0.2580	0.7404	3

5. Findings of Approach II

5.1. Findings of DEMATEL

The DEMATEL analysis offers a comprehensive view of AU's strategic goals, revealing their interrelationships and causal influences. Goals with R-D values greater than zero are identified as "causes," indicating their role as driving factors that positively affect other objectives. Conversely, goals with R-D values less than zero are labelled as "effects," suggesting they are influenced by other goals. As displayed in Table 7, Goal 2 and Goal 5 are considered to be as causal variables, implying that improvements in these areas can positively influence other goals. For example, educating

individuals to be able to effectively express themselves in the national and international arena (i.e. Goal 2) and strengthening the institutional structure by ensuring effective data management and self-assessment processes (i.e. Goal 5) can lead to improvements in various aspects of the university's performance. Goal 2 enhances the university's academic reputation and internationalization by fostering students' communication, critical thinking, and global engagement. Goal 5 improves organizational efficiency and decision-making, enabling better resource allocation, and continuous improvement. Policy implications include internationalization programs and curricular reforms for Goal 2, and reporting standards, digitalization, infrastructure improvements, and regular audits for Goal 5. On the other hand, Goal 1, Goal 3 and Goal 4 are regarded as effects, indicating that they are considered as outcomes of improvements in other areas. The cause-effect diagram, displayed in Figure 3, gives a clearer view of the nature of each goal as it plots goals according to their D+R (i.e. x axis) and D-R (i.e. y axis). Accordingly, DMs should address the "causes" and develop strategies to strengthen goals identified as key drivers, while mitigate the "effects" through implementing measures to support goals identified as key receivers.

Table 7: DEMATEL Results

Goals	R	D	D+R	D-R	Identity	Weight	Normalized
Goal 1	3.948	3.897	7.845	-0.051	Effect	7.845	0.239
Goal 2	3.221	3.583	6.804	0.363	Cause	6.814	0.208
Goal 3	3.551	2.115	5.666	-1.435	Effect	5.845	0.178
Goal 4	3.322	2.688	6.01	-0.635	Effect	6.043	0.184
Goal 5	2.093	3.851	5.944	1.758	Cause	6.198	0.189

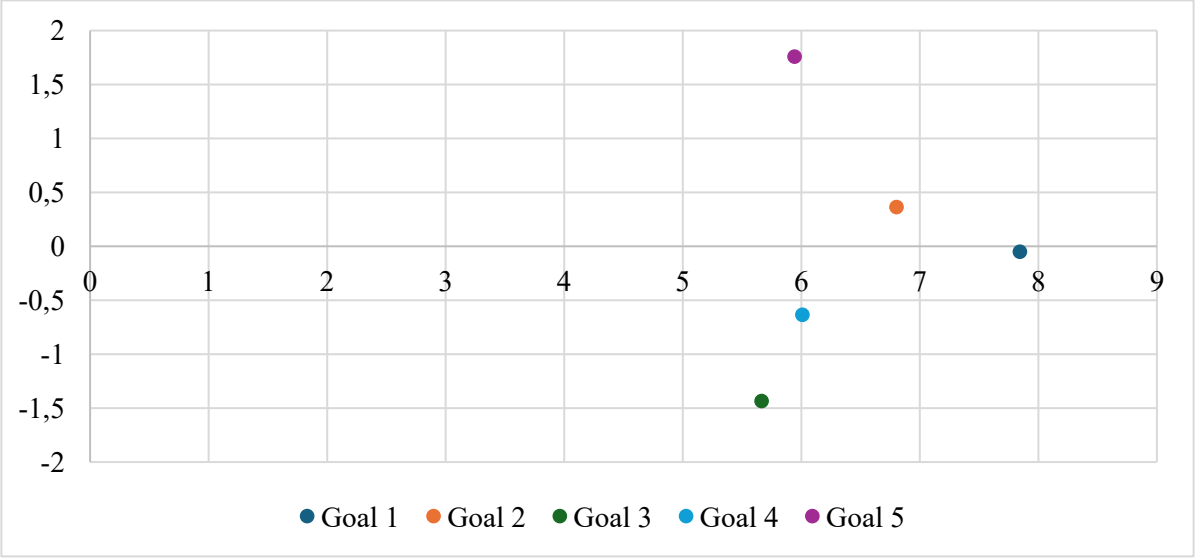

Figure 3: Cause-Effect Diagram

Subsequently, the threshold value is calculated by finding the average of the total relation matrix in order to draw the network map. The threshold value is found to be 0.6454. Any value which is equal or above the threshold is highlighted in Table 8 and is depicted in the diagram in Figure 4. According to Table 10, the goals with the most influence on other goals are Goals 1 and 5. However, the latter is the goal with the less influence received. The goals that are highly influenced by others are Goals 1 and 3; yet the latter has no significant influence on any goals. For AU to prioritize and strategize actions to achieve these goals effectively, strategic team should understand well these relationships. In this case, focusing on Goal 5 and Goal 1 may yield significant improvements across the system due to their strong influence on other goals. Accordingly, the relations between the strategic goals are mapped as a network structure. On the map, the unidirectional arrows denote that the goal from where the arrow starts only affects the goal at which the arrow points; whereas bidirectional arrows indicate mutual effect.

Table 8: Total Relations Matrix

	Goal 1	**Goal 2**	**Goal 3**	**Goal 4**	**Goal 5**
Goal 1	0.7567	0.8056	0.9227	0.8794	0.5328
Goal 2	0.9413	0.5744	0.7704	0.7902	0.5071
Goal 3	0.5461	0.4715	0.3746	0.4280	0.2952
Goal 4	0.7106	0.5627	0.6101	0.4500	0.3544
Goal 5	0.9931	0.8066	0.8728	0.7748	0.4036

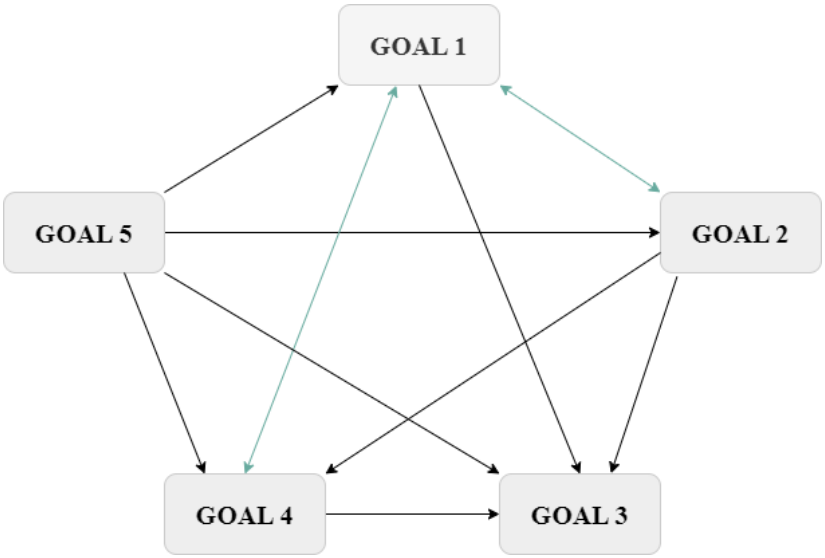

Figure 4: DEMATEL Network Map

As the last step, the influence weight of each goal is calculated to prioritize it based on its overall

influence within the strategic plan, as displayed in Figure 5. Goals with higher weights are more influential in the system. They either influence many other goals or are influenced by many goals, or both; while goals with lower weights are less influential. In this application, Goals 1 and 2 have the highest influence score, 0.239 and 0.208 respectively. It is important to note that although Goal 1 is ranked first, it is an effect goal; thus, DMs should allocate resources and efforts to manage and monitor Goal 2 more as it significantly impacts the strategic performance and influences other goals.

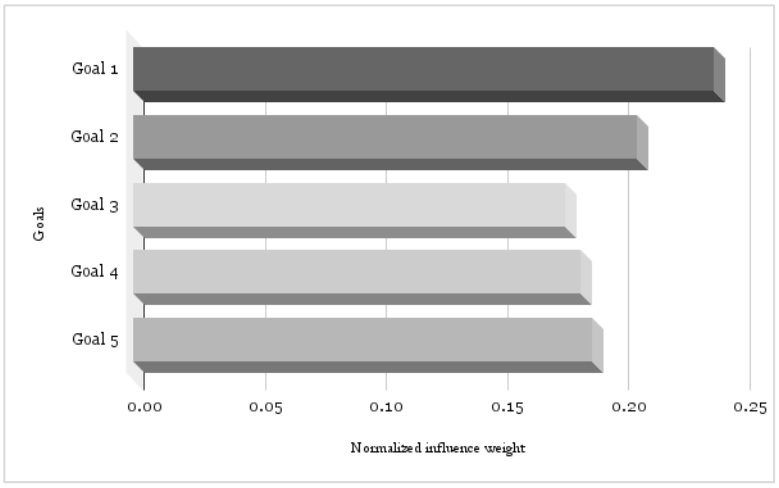

Figure 5: DEMATEL Goals Influence Weights

The DEMATEL analysis underscores the interdependence of strategic goals at AU, emphasizing the need for a balanced approach to strategic planning. While addressing cause goals can positively impact other goals, improving effect goals requires careful consideration of the causal factors influencing them. While the DEMATEL findings provide the university with valuable insights for prioritizing its strategic objectives and enhancing its strategic planning, it is crucial to acknowledge that this application is merely a suggestion from the authors on how to implement DEMATEL in this context. The measurement of the interdependence of goals was done subjectively as it includes only one expert's judgments, as displayed in Table A2.

5.2. Findings of TOPSIS

The last phase of the application is including the influence weights as a factor to compare the list of AU strategic goals. With equal weights, importance, influence and costs are thus the factors by which prioritization of goals is determined. According to Table 9, Goals 4, 1, 2, 5 and 3 are respectively ranked. That is, increasing the institution's entrepreneurship capacity, producing valuable research and improving the competencies of students and productivity of academic staff should be on top of the priority for AU. This would help the latter improve its strategic performance in the upcoming year and

wisely allocate its budget.

Table 9: AHP-DEMATEL-TOPSIS Application

Goals	Importance	Influence	Cost	SI+	SI-	Pi	Rank
Goal 1	0.0600	0.0799	0.0061	0.0217	0.1528	0.8758	2
Goal 2	0.0813	0.0694	0.1560	0.0105	0.0440	0.8074	3
Goal 3	0.0384	0.0595	0.1271	0.1357	0.0288	0.1752	5
Goal 4	0.0738	0.0615	0.0019	0.0199	0.1581	0.8881	1
Goal 5	0.0800	0.0631	0.0421	0.0454	0.1213	0.7277	4

6. Discussion

In the context of AU's strategic planning, the prioritization of goals is crucial for optimizing the university's performance. Providing a three-scenario TOPSIS application, using criteria weight variations, is considered as a sensitivity analysis to show how the prioritization model can generate different results in different contexts or when having different DMs' opinions (Demir & Arslan, 2022). For instance, some DMs would be more concerned about achieving the most important goals, with little focus on their costs. This type of DMs cares more about the effectiveness of the strategic plan than its efficiency (Powell et al., 2012). They do not consider the costs as a constraint as it is a public institution and the budget is provided by the government. Other DMs would think more efficiently as they prefer to stay in budget even if not all goals are achieved (Mabayo, 2024). While the third type of DMs would want to give equal weights to the importance and cost of goals, believing that both factors are equivalently important to prioritize goals. Although the findings of scenarios intersect in some goals, they are globally different. For instance, when equal weights are given to goals importance and costs, the goal to be prioritized is Goal 1, which involves producing high-quality research. However, when goal importance is preferred over goal cost, Goal 4, which represents enhancing the entrepreneurship capacity, becomes on top of the priorities. In the last scenario, Goal 4 is also prioritized. Nevertheless, in all the scenarios Goals 2 and 3 are the least significant within the strategic plan. Unlike AHP model, where Goal 2 was the most important; the three scenarios of TOPSIS showed that Goal 2 is among the least crucial goals. The results are not contradictory; in the former application, only the importance of the goal is taken into consideration, while in the latter, both the importance and the cost are included as comparison factors. Hence, if the university seeks to have an overall look on its strategic plan and prioritize its goals, AHP application is sufficient to do the task (Kaloutsa et al., 2025) but if it seeks goal prioritization, efficiency and budget allocation optimization, it is recommended to employ the hybrid application, combining AHP and TOPSIS together.

Moreover, including DEMATEL to the hybrid application in Approach II allows DMs to have a close-up look at the nature of each goal and its relationship with others. The findings of the second approach can be very beneficial to the university as it offers insights that can optimize to the prioritization process's outcomes. Certain strategic goals emerge as particularly important and interconnected, offering insights into the university's strategic roadmap. Among the identified goals, increasing the quality of students and the productivity of academic staff (i.e. Goal 2) stands out as a critical cause that positively influences others. This goal is closely linked to increasing the entrepreneurship capacity of the institution (i.e. Goal 4) and increasing the value-added research outputs (i.e. Goal 1), indicating a clear pathway for improving the university's academic and research capabilities. The findings are coherent with the nature of the university. Since AU is a public institution, it is expected to give more importance to the educational level even if it is at the expense of other goals. Giving also more importance to the research field is indispensable for AU as it is selected by the Turkish Council of Higher Education as a research university. The interconnected nature of these goals highlights the need for a holistic approach to strategic planning. This work was thence an attempt to guide AU through the process of prioritizing these goals and recognizing their interdependencies.

7. Conclusion

The application of MCDM methods has proven beneficial in prioritizing goals and understanding their interrelationships. These methods offer a systematic and rigorous approach to decision-making, providing valuable insights into complex organizational issues. Moreover, the backward reasoning methodology was successfully applied, progressing from the predefined local importance weights of KPIs to determine first the weights of their corresponding objectives and subsequently those of the associated goals. The findings from this study can serve as a blueprint for Ankara University and other similar institutions looking to enhance their strategic planning processes. Moving forward, it is essential for AU to implement its prioritized goals effectively, taking into account their interdependencies and ensuring a balanced approach to strategic planning.

Despite the valuable insights gained from this study, several limitations should be acknowledged. First, as the study focused primarily on Ankara University, this may limit the generalizability of the findings to other universities, especially those outside of Türkiye, since goals and performance indicators used in the present article are specific to AU. Future studies could replicate the study in other institutions using their own KPIs, objectives and goals to validate the solution. Second, the study relied mainly on data collected from a single source, the university's strategic plan, which may introduce bias or

incomplete information. Future researchers could incorporate data from multiple sources to enhance the robustness of the analysis. They could also explore the integration of qualitative data to provide a more comprehensive understanding of strategic goals and their interrelationships. Third, as this study was an attempt to show DMs how to prioritize their strategic goals, the DEMATEL application was conducted based on the judgments of only one expert. The results of DEMATEL would therefore be considered subjective and would not project the actual point of view of AU management team. Having several opinions and following a fuzzy logic would be recommended for future works. Fourth, external factors such as economic, political, or social changes, which could impact the university's strategies, were not considered. Finally, it is recommended to consider conducting comparative analyses across multiple universities to identify common patterns and differences in strategic planning processes.

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BEYANLAR / DECLARATIONS

Çıkar Çatışması Beyanı

Yazarlar herhangi bir çıkar çatışması olmadığını beyan eder.

Declaration of Conflict of Interest

The authors have no conflicts of interest to declare.

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Katkı Oranı Beyanı

Yazarlar makaleye eşit oranda katkı sağlamıştır.

Declaration of Contribution

The authors have equally contributed to the manuscript.

APPENDIX

Table A1: AHP Findings – Objectives Level

	Objectives	Importance	Rank
O 1.1	Increasing high value-added research outputs that contribute to Sustainable Development Goals	0.045321	10
O 1.2	Increasing the quality of researchers and implementing incentive mechanisms	0.051191	6
O 1.3	Developing research infrastructure and support services and ensuring their effective use	0.036959	16
O 1.4	Monitoring and improving research processes	0.046542	8
O 2.1	Equipping students with the skills demanded by the contemporary era through the promotion of innovation and quality in education and training programs	0.038966	15
O 2.2	Increasing the productivity and competence of academic staff	0.050403	7
O 2.3	Increasing the number of international academic collaborations and beneficiaries	0.033182	20
O 2.4	Increasing scientific, social and cultural activities	0.069832	4
O 2.5	Increasing the quality of graduate education	0.051392	5

O 3.1	Increasing training, information and awareness-raising activities for the needs and development of the society	0.035940	17
O 3.2	Increasing the quality, capacity and technology of health services provided	0.039480	14
O 3.3	Increasing the services provided by the institution for the benefit of society	0.039651	13
O 4.1	Increasing training activities to encourage entrepreneurship	0.033182	18
O 4.2	Increasing scientific and technological research competence related to public-university-industry cooperation and entrepreneurship	0.046307	9
O 4.3	Improving intellectual property pool capacity	0.045063	11
O 4.4	Encouraging intrapreneurship within the institution	0.096722	1
O 5.1	Developing self-assessment studies throughout the institution	0.070141	3
O 5.2	Raising awareness on data management	0.096722	2
O 5.3	Increasing institutional belonging and satisfaction	0.033182	19
O 5.4	Improving the technological and physical infrastructure and increasing the number of beneficiaries	0.039822	12

Table A2: DEMATEL – Expert Judgments

	Goal 1	**Goal 2**	**Goal 3**	**Goal 4**	**Goal 5**
Goal 1	0	3	4	4	2
Goal 2	4	0	2	3	2
Goal 3	2	2	0	1	1
Goal 4	3	2	2	0	1
Goal 5	4	3	3	2	0