

Determination of Features Used in the Global Entrepreneurship Monitor through Artificial Intelligence

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ABSTRACT

Purpose: To determine the items that need to be concentrated in order to increase the development levels of the countries in the GEM report with artificial intelligence technique, but at the same time, it is aimed to examine the situation of Turkey.

Methodology: The data were taken from the GEM report and the Adaptive Neuro-Fuzzy Classifier with Linguistic Hedges method was used.

Findings: It has been determined that the most important factor affecting the development levels in terms of entrepreneurship is "Government policies: Taxes and bureaucracy" corresponding to 2b in the GEM report. Turkey's 2b score is 3.4 out of 9. In this context, it has been revealed that priority arrangements for Turkey should be in government policies including taxes and bureaucracy.

Practical Implications: Countries that want to develop in terms of entrepreneurship should first give priority to developments within the scope of "Government policies: Taxes and bureaucracy".

Originality: In this study, artificial intelligence technique, which are very popular today, were used rather than the methods commonly used in the field of social sciences.

Key Words: The Global Entrepreneurship Monitor, Entrepreneurship Ecosystem, Artificial Intelligence, Adaptive Neuro-Fuzzy Classifier with Linguistic Hedges

JEL Codes: L20, L26

Küresel Girişimcilik Monitöründe Kullanılan Özelliklerin Yapay Zeka Aracılığıyla Belirlenmesi

ÖZ

Amaç: GEM raporunda yer alan ülkelerin, girişimcilik açısından gelişmişlik düzeylerini arttırabilmeleri adına yoğunlaşılması gereken maddelerin yapay zekâ tekniği ile belirlenmesi, ama aynı zamanda Türkiye'nin durumunun incelenmesi amaçlanmıştır.

Yöntem: Veriler GEM raporundan alınmış, Adaptive Neuro-Fuzzy Classifier with Linguistic Hedges yöntemi kullanılmıştır.

Bulgular: Girişimcilik açısından gelişmişlik düzeylerini etkileyen en önemli faktörün, GEM raporundaki 2b ye karşılık gelen "Devlet politikaları: Vergiler ve bürokrasi" olduğu belirlenmiştir. Türkiye'nin ise 2b puanı 9 üzerinden 3.4'tür. Bu bağlamda Türkiye için öncelikli düzenlemelerin vergiler ve bürokrasiyi içeren devlet politikalarında olması gerektiği ortaya konulmuştur.

Sonuç ve Öneriler: Girişimcilik açısından gelişmek isteyen ülkelerin öncelikle "Devlet politikaları: Vergiler ve bürokrasi" kapsamındaki geliştirmelere öncelik vermeleri gerekmektedir.

Özgün Değer: Bu çalışmada sosyal bilimler alanında yaygın kullanılan yöntemlerden ziyada günümüzde oldukça popüler olan ve yapay zekâ tekniği kullanılmıştır.

Anahtar Kelimeler: Küresel Girişimcilik Monitörü, Girişimcilik Ekosistemi, Yapay Zekâ, Dilsel Kuvvetli Adaptif Sınırlanlık Sınıflayıcı

JEL Sınıflandırması: L20, L26

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1. Introduction

The notion of entrepreneurship has been an important concept for countries and individuals from past to present. With the development of entrepreneurship, both individuals and countries gain economic benefits (Amoros, Cristi, and Naude 2021). For this reason, countries make certain regulations and practices to develop entrepreneurship. Thus, by making the entrepreneurial environment more suitable in the country, support is provided to increase entrepreneurial activities. It is possible to encounter regulations and studies at regional, national or international scales on behalf of entrepreneurship. At the same time, there are many reports published with the studies carried out on a global scale. The Global Entrepreneurship Monitor (GEM) report is one of these reports.

In the analysis of this study, entrepreneurial framework conditions data, which includes 62 countries in total, including Turkey, obtained from the GEM's report published in 2015/16, were used. The reason for using the data of 2015/16; It is the common year in which the specified attributes are fully obtained, including Turkey. It is important for countries to be ranked at higher classes. The desired situation in terms of countries is that all features are improved and thus, they move up to higher classes. However, it is not possible for countries to make improvements in all features at the same time in most cases. Therefore, it is important to identify the features with higher significance level in determining the classes. Countries can move up to higher classes by prioritizing improvements in these features. From this point of view, this study explored the significance levels of the features used in determining the classes and thus classifying them by using the determined features. As a method, the Adaptive Neural-Fuzzy Classifier (ANFC-LHs) method, which is among the artificial intelligence techniques, was used. The reason why the ANFC-LHs method is preferred is that it is a very successful method that determines the significance levels of the features as well as performing the process in the classification process. Thanks to the most important features determined as a result of the research, it has been revealed which features Turkey needs to develop in order to move to a higher class. Accordingly, recommendations have been developed. Unlike the studies in the literature, the data in question were analyzed by the ANFC-LHs method, which is one of the artificial intelligence techniques. The method basically consists of two stages. The first step is to calculate the degree of influence of the existing features on the classification. The second stage is to measure the reliability of the findings,

together with calculating the success rate of the new classification made by increasing the importance level of the determined features.

In this study, thanks to the first stage of the method used, the importance levels of the features used in the classification, which express the development levels of the countries in terms of entrepreneurship, were calculated. Thus, the items that countries should focus on in order to increase their level of development in terms of entrepreneurship have been revealed. In particular, the factor identified as the most important was emphasized. Subsequently, the success rate of the new classification was calculated by increasing the importance level of the features determined as the second stage of the method used.

2. The Global Entrepreneurship Monitor (GEM)

GEM has been trying to determine the entrepreneurship levels of that year by publishing a global report every year since 1999. Turkey got involved in the research for the first time in 2006. Because of the comprehensive research, various measures of entrepreneurship values belonging to the countries are obtained and these values form a database. Therefore, GEM is a highly reliable source of entrepreneurship.

In the GEM report published in 2015/16, countries were classified in terms of entrepreneurship levels within the entrepreneurial framework conditions consisting of 12 features. The entrepreneurial framework consisting of 12 factors in the report and the classes created by using these factors are given in Table 2. In general, this set of features presents a comprehensive data set for understanding the impact of entrepreneurship on society and measuring society's support for entrepreneurial activities. As a result of these features, the classes that express the development of countries in terms of entrepreneurship. The classes expressed in the report and the information of the countries included in these classes are given in Table 1.

Table 1. GEM 2015/16 Report classes showing the development levels of countries and countries included in classes GEM 2015/16

Class	Countries
1: Factor-driven	Burkina Faso, Cameroon, Senegal, India, Vietnam
2: Transition to efficiency-driven	Botswana, Iran, Philippines
3: Efficiency-driven	Egypt , Morocco , South Africa, Tunisia, China, Indonesia, Thailand, Colombia, Ecuador, Guatemala, Peru, Bulgaria, Macedonia, Romania
4: Transition to innovation-driven	Kazakhstan, Lebanon, Malaysia, Argentina, Barbados, Brazil, Chile, Mexico, Panama, Uruguay, Croatia, Hungary, Latvia, Poland, Slovakia, Turkey
5: Innovation-driven	Australia, Israel, Republic of Korea, Taiwan, Puerto Rico, Belgium, Estonia, Finland, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Canada, United States of America

Source: GEM (2016). GEM 2015 / 2016 Global Report

There are five countries in the first Class rated as the lowest class, three countries in the second Class, 14 in the third Class, 16 in the fourth Class, and 24 countries in the fifth Class, rated as the highest level. Turkey is in the fourth Class, which was considered as the second best among these classes (Table 1).

3. Artificial Intelligence and Feature Selection

Artificial intelligence is one of the concepts that is extremely popular today. The concept of artificial intelligence, as its name suggests, aims to artificially imitate intelligence. Hence, it will be useful to explain what the concept of intelligence means. The concept of intelligence can be expressed as all processes such as thinking, reasoning, comprehension, perception, and deduction (Huang and Rust 2021). The concept of artificial intelligence, on the other hand, aims to realize the concept of intelligence in inorganic materials (Pan and Zhang 2021). In other words, it is an effort to give machines to function in an intelligent manner (Hamet and Tremblay 2017).

Thus, thanks to the artificial intelligence methods, they reveal the opportunity to perform many operations that can be performed with intelligence faster

and with less error. When the content of the concept of artificial intelligence is examined, it is found that it is an incredibly detailed concept and has many sub-titles. Concepts such as intelligent systems, machine learning, data mining, expert systems, decision support systems, optimization methods, fuzzy logic, classification and clustering operations, curve fitting methods, image processing techniques, and feature selection are just some of the concepts that can be expressed in relation to artificial intelligence. The fact that artificial intelligence techniques have a wide range of usage areas that can be associated with so many concepts also means that they are used in the solution of many problems. For this reason, it can be used in many areas and when the literature is examined, it is reported that successful results have been obtained mostly in studies associated with artificial intelligence. This has led to the increase in the use and popularity of artificial intelligence techniques in many fields including social sciences (Contreras and Vehi 2018).

One of the concepts related to artificial intelligence is the feature selection process. Feature selection is among the data mining methods, which are closely related to the concept of artificial intelligence and is considered as a process performed in the data pre-processing stage. While determining the features or revealing the significance levels of the determined features, it is essentially investigated how effective they are on the result. Not all features are equally effective on the result. In this case, by evaluating the effects of the features on the result, the features that are determined to have no effect can be extracted and the significance levels of the features determined to have an effect can be identified. Thus, it is possible to obtain more successful results by focusing on fewer but more relevant features. When the literature is examined, it is found that there are studies conducted about the development of feature selection methods and the comparison of the performance of existing feature selection methods. In addition to these, it is found in literatures that feature selection studies are carried out with the with the existing feature selection methods.

The following studies can be given as examples for the new approaches. Çelik and Bilge (2015) presented a new mutual information approach for feature selection. Zheng, Zhu, Wen, Zhu, Yu, and Gan (2020) worked on creating a feature selection model by using the self-representation method. The following studies can be given as an example of comparing the performances of existing feature selection methods. Eskidere (2012) worked on the comparison of six different feature selection methods for the diagnosis of Parkinson's disease.

Aydemir (2017) compared different feature selection algorithms used for determining effective features in terms of accuracy and speed.

There are certain studies that can be given as study examples that make feature selection with existing methods. For example, Phadikar, Sil, and, Das (2013) conducted research on the classification of rice diseases by performing rule creation and feature selection methods. Canayaz and Demir (2017) performed feature selection with the whale optimization algorithm, one of the meta-heuristic algorithms and evaluated it with the artificial neural networks method. Keleş and Keleş (2018) studied the prediction and classification of employees' leadership perceptions in production management. As an application, they used the genetic algorithm, which is one of the artificial intelligence methods on the prepared data set and performed the feature selection and then made the classification. Moreover, Sağbaşı, Gökalp, and Uğur (2019) worked on the feature selection based on distance ratios for facial expression recognition. Doğan (2020) conducted research on improving recurrent deep neural networks using feature selection methods. Feature selection was performed on the GEM data using the similar ANFC-LHs method in this study.

4. Research Method

This research studied the determination of the significance levels of the features used to determine the classes that express the development of countries in terms of entrepreneurship and their classification by using the identified features. The ANFC-LHs, which is among the artificial intelligence techniques, was used as a method.

The ANFC-LHs method is a two-step method. With the ANFC-LHs, the significance levels of the features are determined first and then the classification process is performed (Çetişli 2006). It is important to determine the significance levels of the features because while performing the classification or clustering operations, the significance level of each feature may not be the same on the determination of classes or clusters. In this case, the success of the classification or clustering operations can be enhanced with the determination and weighting of the features of high levels of significance. At the same time, focusing on the features with high levels of significance helps to reach the result more quickly in cases when the samples are desired to change places between the classes. For example, if there are samples which desire to be replaced between the classes

that express the state of development, the improvements made to switch to the class with higher level of success should be performed on the features with a higher level of significance and thus, this can facilitate the process.

While determining the significance levels of features with the ANFC-LHs method, fuzzy set rules are used (Pence and Çetişli 2013). Thus, the features are determined gradually. While this condition determines the significance of the features, it prevents a logic control such as important or not and thus enables the evaluation of wider possibilities such as less important, important, very important, extremely important. Hence, the evaluation results closer to human inferences are created. Linguistic forces are used when determining the significance level with the ANFC-LHs (Firat, Yurdusev and Mermer 2008).

The reinforced A linguistic terms for the different p values $\{-2, -0.5, 0, 0.5, 1, 2\}$ of the linguistic forces applied to the linguistic term A are given in Figure 1 (Çetişli 2006).

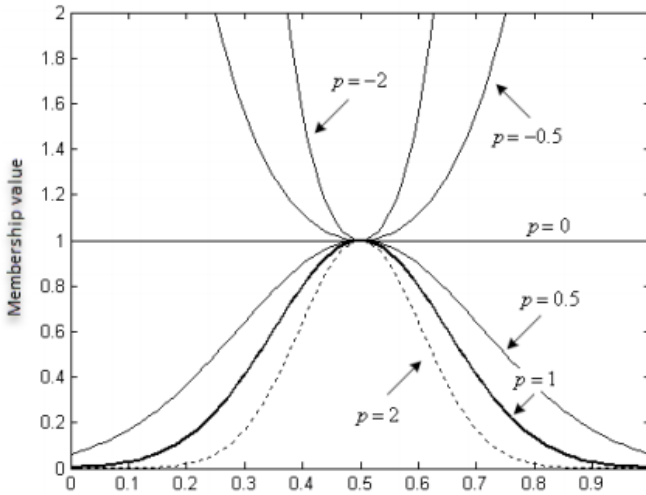


Figure 1. Interpretations of linguistic forces applied to the linguistic term: A for different p values (Çetişli 2006).

As seen in Figure 1, when p is smaller than 0 ($p < 0$), the direction of the membership function changes and as a result of this situation, membership values are greater than 1. It is not desirable for the membership value to be outside

the range of $[0 + 1]$. Because if it is outside of this range, it removes the fuzziness of the obtained clusters. For this reason, the desired state is $p = 0$ or $p > 0$. This p value is taken into consideration when determining the significance levels of the features with the ANFC-LHs. A value of 0 for P value means that the feature has no significance and if P value is 1 for the feature, this means that it is very important. For intermediate values, the significance level gradually increases as it approaches from 0 to 1 (Çetışli 2006).

5. Data Set

The minimum, maximum and average values of the entrepreneurial framework conditions consisting of 12 features for 62 countries were presented in Table 2.

Table 2. Features and properties

Feature number	Feature name	Min. Value	Max. Value	Average Value
1	1: Entrepreneurial finance	2.8	5.8	4.19
2	2a: Government policies: Support and relevance	2.6	6.5	4.17
3	2b: Government policies: Taxes and bureaucracy	1.9	5.8	3.88
4	3: Government entrepreneurship programs	2.1	6.0	4.23
5	4a: Entrepreneurship education at school stage	1.6	5.6	3.15
6	4b: Entrepreneurship education in the post-school period	3.1	6.3	4.58
7	5: R&D Transfer	2.4	6.2	3.84
8	6: Trade and legal infrastructure	2.8	6.3	4.95
9	7a: Internal Market dynamics	3.2	7.3	4.99
10	7b: Internal market loads or entry regulations	2.9	6	4.17
11	8: Physical infrastructures	3.5	7.9	6.33
12	9: Cultural and social norms	2.6	7.4	4.70
13	1, 2, 3, 4, 5 (class label) 1: Factor-driven, 2: Transition to efficiency-driven 3: Efficiency-driven, 4: Transition to innovation-driven , 5: Innovation-driven			

Source: GEM (2016). GEM 2015 / 2016 Global Report

Detailed information about the data specific to Turkey were given in Table 3.

Table 3. Turkey's sufficiency scores regarding entrepreneurial framework conditions

Feature name	Score (1=Highly insufficient, 9= Highly sufficient)
1: Entrepreneurial finance	3.8
2a: Government policies: Support and compliance	4.4
2b: Government policies: Taxes and bureaucracy	3.4
3: Government entrepreneurship programs	4.1
4a: Entrepreneurship education at school stage	2.2
4b: Entrepreneurship education in the post-school period	5.2
5: R&D Transfer	4.2
6: Trade and legal infrastructure	5.1
7a: Internal Market dynamics	5.6
7b: Internal market loads or entry regulations	3.9
8: Physical infrastructures	6.5
9: Cultural and social norms	5.3
1, 2, 3, 4, 5 (class label)	4
1: Factor-driven, 2: Transition to efficiency-driven 3: Efficiency-driven, 4: Transition to innovation-driven , 5: Innovation-driven	

Source: GEM (2016). GEM 2015 / 2016 Global Report

As presented in Table 3, the lowest score Turkey got is entrepreneurship education at the school stage and its value is 2.2 out of 9. The highest is physical infrastructures and its value is 6.5 out of 9. Other feature values are ranked between these two values. As a result of these 12 feature values, Turkey is ranked at the 4th class called "transition to innovation based".

In this study, 12 features that constitute the entrepreneurial framework conditions were used as input and class labels in the form of 1, 2, 3 expressing the development of countries in terms of entrepreneurship were used as output. The features contain values between 1 and 9, including numbers with commas and the higher numbers mean that the sufficiency is higher, too. Thus, all features were used as numerical values.

6. Findings and Evaluation

The ANFC-LHs method, one of the artificial intelligence techniques, was used in this study and the research explored the determination of the significance levels of the features used in identifying the classes that express the development of countries in terms of entrepreneurship and the classification of the countries by using the specified features. The content of the data set is as follows: It involves information about which of the five classes the countries belong to as a result of 12 features including the entrepreneurial framework conditions for 62 countries in total, which are used to express the development levels of countries about entrepreneurship. In this study, the features with high levels of significance used in determining the classes which included the countries were determined and the classification process was carried out using the specified features. Therefore, the features that countries can focus on when they want to switch between the classes are revealed.

The model of the fuzzy rules belonging to the ANFC-LHs was exhibited in Figure 2 and the significance levels determined for the features were presented in Figure 3. The features presented in Figure 2 and Figure 3 were used in the same order as the feature number in Table 1.

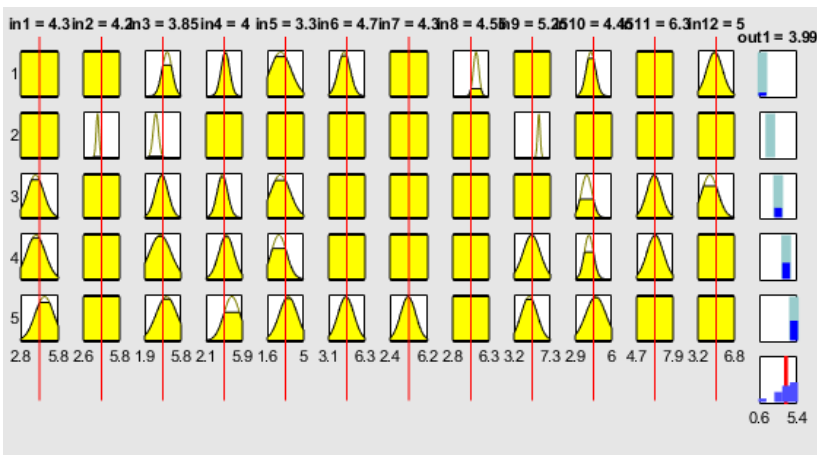


Figure 2. The model of fuzzy rules belonging to ANFC-LHs

Figure 2 shows the degree of contribution of the features expressed by the ANFC-LHs. The contribution levels of the important features expressed by the ANFC-LHs are shown in Figure 3.

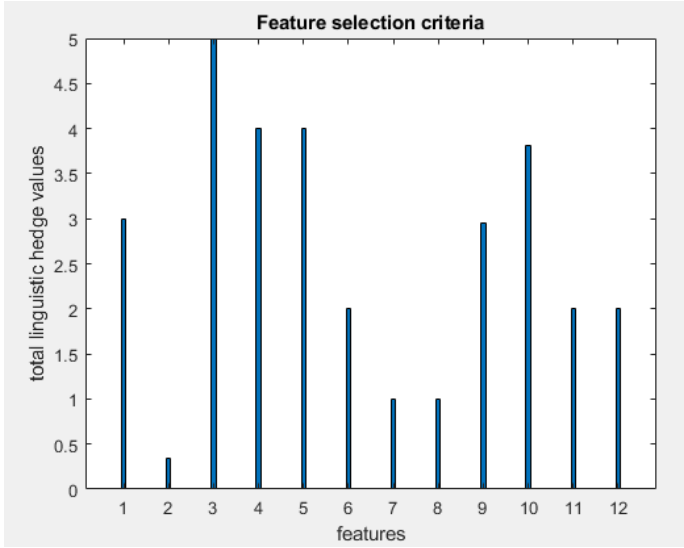


Figure 3. Feature selection criteria

As seen in Figure 3, there are differences in the significance levels of the features. The significance levels determined as a result of the findings obtained were presented in Table 4 with the feature names in order to understand the order of the significance levels of the features.

Table 4. The significance levels of the features determined with ANFC-LHs

Significance Level	Feature Name
Features with the highest level of significance	"Government Policies: Taxes and Bureaucracy" expressed with the number 3.
Features with the second highest level of significance	"State entrepreneurship programs" expressed by the number 4. "Entrepreneurship Education at School Stage" expressed by the number 5. "Internal Market Loads or Entry Regulations" expressed with the number 10.
Features with the third highest level of significance	"Entrepreneurial finance" expressed by the number 1. "Internal Market dynamics" expressed by the number 9.
Features with the fourth highest level of significance	"Entrepreneurship education in the post-school period" expressed with the number 6. "Physical infrastructures" expressed with the number 11. "Cultural and Social Norms" expressed with the number 12.
Features with the fifth highest level of significance	"R&D Transfer" expressed with the number 7. "Commercial and Legal Infrastructure" expressed with the number 8.
Features with the sixth highest level of significance (In other words, features with the least level of significance)	"Government policies: Support and relevance" expressed with the number 2.

The data set consists of a total of 62 samples with 12 features. For classification, the data were randomly divided into two accounting 70% (43 samples) training and 30% test (19 samples) data and the training was carried out in 1000 iterations. When the results of the classification performed with the specified features were examined, it was reported that 100% success was achieved for the training data and 75% for the test data. These rates demonstrate the validity and reliability of the findings obtained in the study. These results reveal that all the training data and an extremely high part of the test data were estimated correctly

in the classification made with the specified features. These results present that the identified features can be used in the classification of countries according to their development levels in terms of entrepreneurship.

7. Results and Suggestions

The economic growth and development of countries highly depends on the entrepreneurial activities taking place in that country (GEM, 2013). Carree, van Stel, Thurik and Wennekers (2002) argue that there is a relationship between entrepreneurship and economic growth in the long run and a low rate of macro-economic growth will occur in a country where optimum entrepreneurial activity does not take place. According to The Legatum Prosperity Index (Legatum Enstitüsü 2013) rates, there is a positive relationship between the level of entrepreneurship and the level of welfare in developing and underdeveloped countries. When the rates of entrepreneurship decline, the welfare levels of the countries also decline.

Entrepreneurship indicators vary widely between the countries. The GEM report is a report that examines countries within the framework of certain criteria and presents comparative results in many aspects regarding entrepreneurial activities. One of the information included in the report is the determination of the classes that express the development of countries in terms of entrepreneurship. The desired situation for the countries is to increase the level of development in the field of entrepreneurship by taking place in the 5th class, which is expressed as the best class. The best solution to achieve this goal is to improve all the features evaluated and to reach high levels. However, it may not always be possible for countries to make an improvement in all features at the same time. In this case, if a determination can be made in the significance levels of the features used in identifying the classes about their effects on the result, the focus must be on the features that are determined to have high levels of significance in certain circumstances when the improvements are not made with all features at the same time; thus, the realization of improvements will increase the opportunities for countries to be ranked at higher classes. Due to this reason, the determination and classification of the significance levels of the features used to identify the classes that express the development in terms of entrepreneurship in the GEM report were explored in this study. As a result of the findings, there are differences in the significance levels of the features in determining the classes.

According to the results of the analysis, the feature with the highest level of significance is the *“Government policies: Taxes and bureaucracy”* expressed with the number 3. This finding is an indication that entrepreneurship is a multidimensional phenomenon that is affected not by a single variable but by many variables. In the light of these results, it will be beneficial for the countries that want to be ranked in the higher classes than the class they are in to give priority to the features that are determined to have high levels of significance by taking into consideration their country’s conditions in the classification made in terms of entrepreneurship. For example, when making improvements, it may be suggested that all countries start improvements with the feature of *“Government policies: Taxes and bureaucracy”*. When the scores of the parameters affecting the entrepreneurship level in Turkey are examined, it is seen that *“Government policies: Taxes and bureaucracy”* is among the parameters with low scores. With this study, it was emphasized that the *“Government policies: Taxes and bureaucracy”* parameter, which was emphasized to be changed because it was determined to be the most important parameter affecting the level of entrepreneurship, should also be increased in the study conducted by (Bilginer, 2017). In another study (Pehlivanoğlu and Kayan, 2019), comments referring to the *“Government policies: Taxes and bureaucracy”* parameter were made, such as bureaucratic obstacles and high tax rates in Turkey. It has been mentioned that improvements should be made in order to eliminate these deficiencies. (Karadeniz and Özdemir, 2009) evaluated the situation of Turkey using GEM data. Among the comments made, he also mentioned the need to increase state-supported regulations in general. In this context, when the literature is examined, it is seen that the findings obtained in this study are similar and supported by the literature.

Afterwards, if they follow the order of significance levels, this will help them to move to higher levels as a class. The results of the studies carried out about entrepreneurship in the literature revealed that the concept of entrepreneurship in general was evaluated together with several environmental factors and the conditions in the region were also considered. Therefore, as emphasized in the study of (Şengül, 2022), the desired situation is to develop and support as much as possible. Because the more points are edited, the better the results will be. This situation makes up the biggest evidence that we should not evaluate a social and economic concept such as an entrepreneurship alone. In particular, governments have an impact on entrepreneurship in many aspects including state policies, regulations, education, finance, economic policies, taxes, and legal infrastructures.

Therefore, the right planning made by the states will make great contributions to the creation of an entrepreneurship environment. Government policies: taxes and bureaucracy which are determined as the most important feature especially support this phenomenon in this study. In this case, it is possible to state that increasing government policies, programs and training will have a positive effect on the entrepreneurial ecosystem.

The success rate of the classification varied out with the specified features was 100% on the training data and 75% on the test data. These success rates mean that all the training data and the majority of the test data are correctly estimated as a result of the classification performed with the specified features. These rates mean that the findings obtained are valid and reliable. In other words, it can be stated that the features that are important in determining the development levels of the countries in the field of entrepreneurship within the scope of the GEM report are identified correctly.

When GEM data are examined specific to Turkey, it is reported that Turkey is in the 4th class called *"Transition to Innovation-driven"*. Considering the fact that the best level is the 5th class, the 4th class is the second best level. Therefore, it would not be wrong to say that the class in which Turkey takes place is among the good classes. Nevertheless, it is desirable for Turkey to be promoted to the 5th class, which is the best level, by making some adjustments.

Turkey should give more importance to the field of *"Entrepreneurship Education at School Level"*, which is the second most important attribute so that Turkey can move up to a higher-class level. Considering Turkey's sufficiency scores for the entrepreneurial framework conditions, it is reported that Turkey is quite weak in *"entrepreneurship education at the school level"* (2,2). This feature is particularly important for Turkey to move up to the next higher class. Considering the significant steps taken by the developed countries in entrepreneurship education, it is revealed that more university-level education is carried out in Turkey depending on the legal regulations on this subject. It is known that entrepreneurship education practices have existed for a long time in some European countries as well as in the USA. When compared to these countries, it can be stated that these studies started late in Turkey and still cannot reach the desired levels. While entrepreneurship courses are offered at universities in Turkey, not offering these courses at high school, middle and primary school levels negatively affects the development of entrepreneurship. Considering that especially

international entrepreneurship education is discussed within the lifelong learning model and entrepreneurial culture is instilled from an early age, this is a big gap for Turkey in terms of creating entrepreneurship intention and developing entrepreneurial skills.

Another feature that Turkey that needs improve is the “*State policies: Taxes and bureaucracy*” (3,4). Even though an intense effort was made to support entrepreneurship in Turkey after 1980, it is known that the desired level could not be reached. The current conventional commercial order and the Turkish bureaucracy prevent the support and incentives from being useful as envisaged. Above all, while determining the conditions for the support and incentives offered to entrepreneurs, the criteria are controlled firmly in order to prevent abuse, the number of enterprises and companies that can benefit from it remains limited and these amounts spent from the public budget cannot be used effectively and efficiently to meet the expected impact throughout the country. It cannot be stated that the Turkish bureaucracy and regulations, which effectively use digital transformation instruments regarding the discharge of taxpayers’ responsibilities to itself, fully understand and adapt to the digital transformation processes.

In addition, improvements need to be made with “*Entrepreneurial finance*” (3,8), which is included within the scope of the features in the third highest level of significance. One of the biggest difficulties entrepreneurs face while implementing their business ideas is access to financial resources. The entrepreneurs who were limited to their own savings, the contribution of their immediate circle or bank financing in the past are now able to access a wide variety of alternative financing resources from angel investors to venture capital, government subsidies to crowdfunding tools. In Turkey, the entrepreneurs’ access to financial resources is generally realized through two channels, namely free market, and public resources. Considering the free market, the banking system and private venture capital firms are important providers of financial resources for entrepreneurs. In addition to the lower level of bank loans offered to the businesses in Turkey, loan interest rates are also higher compared to the countries with similar development levels. In addition to these, the fact that most of the enterprises in Turkey are micro-scale enterprises with weak financial and institutional structures is an important factor that makes it difficult for them to access bank loans.

The importance levels of the features were determined using the ANFC-LHs method and countries were classified according to their development in terms

of entrepreneurship according to the GEM report with the help of the identified features in this study. It is possible to remark that the results obtained and the classification made with the method used yielded successful results. However, this study also has its limitations. The most important limitations are that only one method was used in feature selection and country classification and comparisons were not made with different methods. For future studies, it is recommended that the importance of the features should be determined with different methods and they should be compared with the findings obtained from this study. As a second suggestion, the success rate in the test data can be increased by performing the classification process with different methods finally, if there are appropriate data, the adaptation of this classification, which is actualized on country basis to regions within Turkey can draw interest.

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