

# Measuring Corporate Governance Maturity Level with CRITIC-based ARAS Method

## CRITIC temelli ARAS Yöntemi ile Kurumsal Yönetim Olgunluk Düzeyinin Ölçülmesi

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### ABSTRACT

Corporate governance is a concept that increases the efficiency of companies, plays an important role in gaining the trust of investors, provides foresight in achieving the company's long-term goals, and guides how to audit the company's performance. The performance success of corporate governance principles on a company basis can be demonstrated by the measurability of the Corporate Governance Maturity Level (CGML). In this context, the aim of the study is to evaluate the sectoral group-based performances of companies traded in Borsa Istanbul through MCDM methods, based on the Corporate Governance Maturity Index data calculated by the Central Securities Depository of Türkiye for the 2023 period. The CRITIC method was used to weight the criteria, and the ARAS method was used to rank the alternatives. It has been observed that the ranking results obtained by the ARAS method generally differ with the general scores and rankings calculated by the Central Securities Depository of Türkiye (MKK).

### KEYWORDS

Corporate Governance Maturity Level, ARAS, CRITIC

### ÖZ

Kurumsal yönetim şirketlerin verimliliğini artıran, yatırımcıların güveninin kazanılmasında önemli rol oynayan, şirketin uzun dönemde belirlediği hedeflere ulaşılmasında öngörü sağlayan, şirketin performansına ilişkin denetimlerin nasıl yapılacağına dair yol gösteren bir kavramdır. Kurumsal yönetim ilkelerinin şirketler bazında performans başarısı ise Kurumsal Yönetim Olgunluk Düzeyi (KYOD)'nin ölçülebilirliğiyle ortaya konulabilir. Bu bağlamda çalışmanın amacı Borsa İstanbul'da işlem gören şirketlerin 2023 dönemine ait ve Merkezi Kayıt Kuruluşu tarafından hesaplanan Kurumsal Yönetim Olgunluk Endeksi verileri üzerinden, sektörel grup bazlı performanslarının ÇKKV yöntemleri aracılığıyla değerlendirilmesidir. Kriterlerin ağırlıklandırılması a CRITIC yöntemi, alternatiflerin sıralanmasında ise ARAS yöntemi kullanılmıştır. ARAS yöntemiyle elde edilen sıralama sonuçlarının, genel olarak Merkezi Kayıt Kuruluşu (MKK) tarafından hesaplanan genel puan ve sıralamaları ile farklılaştığı görülmüştür.

### ANAHTAR KELİMELER

Kurumsal Yönetim Olgunluk Düzeyi, ARAS, CRITIC

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## INTRODUCTION

The financial crises experienced after the 1980s made investors, creditors and other stakeholders more conscious of corporate governance practices. Therefore, corporate governance has emerged as a very important phenomenon in recent times (Say, 2020: 4).

Corporate governance is a multifaceted concept. An important part of corporate governance consists of accountability, representative duty, supervision and control mechanisms. In this sense, individuals in any corporate governance system must comply with the rules of the game for the interests and well-being of all stakeholders of that system. Another important point is economic efficiency (Alacaklıoğlu, 2009: 47-48; Doğan, 2018: 85). Corporate governance is defined as a comprehensive system that regulates the relationships between a company's board of directors, managers, shareholders and other stakeholders. This concept was developed to ensure that companies are managed in accordance with the principles of accountability, transparency and sustainability (OECD, 2004).

Corporate Governance Maturity Level (CGML) is a concept used for the performance success of corporate governance practices. KYODs of companies whose shares are traded in Borsa Istanbul are carried out once a year by the Central Securities Depository of Türkiye (MKK). Based on the above explanations, the main purpose of this study is to evaluate the sectoral group-based performances of companies traded in Borsa Istanbul using the CRITIC-based ARAS method, based on the "Corporate Governance Maturity Index" data calculated by MKK for 2023. In this respect, the study differs from the studies in the literature.

In the first part of the study, studies on the subject in the national and international literature are included. In the second section, information about the data set and methodology is given. Finally, the findings of the study are included. It is thought that the results of the study will contribute to internal and external stakeholders in understanding and evaluating the performance of companies in the context of corporate governance practices.

## 1. LITERATURE REVIEW

Below, studies on corporate governance, MCDM methods and corporate governance maturity level are listed separately. In the literature, corporate governance is discussed within the framework of various theoretical approaches, application areas and global perspectives.

The concepts of business ethics and corporate social responsibility (CSR) constitute the ethical dimension of corporate management. The CSR model developed by Schwartz and Carroll (2003) provides an important framework to better understand the ethical dimension of corporate governance. In this context, companies need to adopt a management approach that is not only profit-oriented but also takes environmental and social impacts into consideration. A study conducted by Eren (2017) shows that sustainability-oriented management practices can increase long-term financial performance.

Corporate governance is also closely related to risk management. Companies must proactively manage the various risks they may encounter. In this context, different areas such as financial, operational, legal and reputation risks are addressed. Stulz (1996) and Kaya (2015) point out the importance of integrating corporate governance structures with risk management strategies. This integration enables companies to become more resilient against uncertainties.

Stakeholder approach constitutes another important dimension of corporate governance. This approach emphasizes that a company is responsible not only to its shareholders, but also to all its stakeholders. Donaldson and Preston (1995) analyze in detail the effects of stakeholder theory on corporate governance, revealing that this approach contributes to the general welfare of society while ensuring the long-term success of companies. Additionally, Çelik and İnan (2018) studies also emphasize the importance of stakeholder management.

Innovation is a critical factor for corporate management to maintain its competitive advantage. Companies must create a culture that encourages innovation and manage this process effectively. Manso (2011) and Demir (2019) revealed the positive effects of innovation on company performance by examining how corporate governance structures affect innovative initiatives.

Digital transformation is one of the most important factors determining the direction of corporate management today. Corporate governance plays a critical role in directing the digital transformation process and creating digital strategies, which lead to radical changes in the way companies do business. Bharadwaj et al. (2013) and Aydin (2020) examined the integration of digital business strategies with corporate management and analyzed how digitalization increases the competitiveness of companies.

From a global perspective, corporate governance practices differ depending on the cultural and legal frameworks of countries. Aguilera and Jackson (2003) compared corporate governance systems in different

countries and discussed the impact of cultural differences on these systems. This diversity requires companies operating on a global scale to adopt different management approaches. According to Coffee (2007), legal regulations play an important role in shaping corporate governance. Regulations such as the Sarbanes-Oxley Act (SOX), especially enacted in the United States, have contributed to raising corporate governance standards. Such legal frameworks impose stricter rules on companies' financial reporting and internal controls, thereby increasing investor confidence. Corporate governance is becoming increasingly important in the Turkish context.

It is also possible to come across many studies on MCDM methods in the literature. For example, in his study, Say (2022) ranked technology companies using ARAS and COPRAS methods using financial performance data. The top three technology companies in both methods are companies coded C3, C17 and C6, respectively. In another study in which the asset quality of deposit banks was evaluated with integrated Entropi-TOPSIS methods, Say (2022) concluded that Ziraat Bank, coded B1, generally ranked first in the 11-year period of 2010-2020.

In the study conducted by Kınalı (2022), the five-year financial statements of companies operating in the transportation sector for the period 2016-2020 were examined and the companies were ranked according to their financial performance through the TOPSIS method. As a result of the information obtained as a result of the study, it was determined that financial performance varies among companies every year.

Durisin and Puzone (2009) conducted a bibliometric analysis of KYOD based on more than 1,000 studies conducted between 1993 and 2007. It was determined that the most cited study was the study of Zahra and Pearce (1989). It has been determined that the majority of studies in all relevant periods were given at least one or two citations. It has been evaluated that the issues that emerged in the relevant years lost their importance over time and were taken into consideration as a standard reference.

In his study, Massie (2012) examined the studies in the literature on the main determinants of CSOD. It was evaluated in the study that a clear, applicable definition of corporate governance maturity could be determined.

In their study, Görmen and Korkmaz (2017) first determined the basic dimensions of CRM by conducting a literature review to determine the maturity level of corporate risk management (CRM) and created a survey with sub-parameters for these dimensions. The survey was answered by 100 people working in the public and private sectors and reliability and validity analysis was conducted. It is evaluated that the survey used is reliable and valid and can be used to measure the maturity level of corporate risk management.

In their study, Rehman and Hashim (2019) investigated whether CGML is measurable and whether it differs in sectoral context through a web-based survey method and made various inferences in the context of SPSS results. In the study, it was determined that corporate governance was measurable and it was evaluated that measurement could be carried out by taking maturity levels into account. In the study, it was determined that there was no differentiation in maturity levels in terms of sectors. It is stated that shareholders can make investment decisions by taking CGML data as a reference.

In their study, Korkmaz and Görmen (2022) aimed to develop a model that can be used to measure governance maturity in public institutions. For this purpose, first of all, a comprehensive literature review was made, then various maturity models were examined and the scale compiled from various models to measure the level of governance maturity in organizations was adapted to Turkish culture. The study provides guidance on what needs to be done to improve corporate governance maturity levels in public institutions.

In his study, Botelho (2022) stated that the new indices he developed through AHP (Analytic Hierarchy Process) provide a deeper understanding of the distortion that occurs with the final priority vector. In the study, it was evaluated that distortions could not be measured if only the discrepancy index was used. It has been stated that the indices developed within the scope of the study allow determining and comparing the amount of final priority vector order disorders. In addition, the CGML value was measured via the AHP method in the study, and the findings revealed that it provides a comparison between the pairwise comparison matrix, the last priority vector and AHP.

Arıkan and Yetkin (2023) calculated CGML with the methodology developed within the scope of 68 non-mandatory corporate governance principles, based on 1,397 corporate governance compliance reports (CGCR) data of BIST-listed companies published between 2018-2021, using regression and correlation methods. It examined the relationships between CGML and digital maturity levels (DML) of BIST companies. Arıkan evaluated that the CGML calculation and measurement method he developed within the scope of his study has an indicator quality that can be used in academic studies. In the study, it was determined that the industrial sector score was above the stock market average score, while the service sector score was below the stock market average.

Kılıçarslan (2024) aimed to analyze the Corporate Governance Maturity Level performances of company groups using Multi-Criteria Decision Making Methods (MCDM) using the Corporate Governance Maturity Level data for the 2018-2022 period shared with the public by the Central Securities Depository of Türkiye. It has been determined that the correlation level between WASPAS and MARCOS method ranking results is high. It has been observed that the ranking results obtained by WASPAS, MARCOS and COCOSO methods generally differ with the general success scores and rankings calculated by the Central Registry Agency.

## 2. DATASET AND METHOD

### 2.1. Dataset

In the study, the sectoral group-based maturity level of companies listed on BIST was analyzed based on data for the 2023 period. The data was obtained from the data published in the Central Securities Depository of Türkiye (MKK) Data Analysis Platform (vap.org.tr). The use of these data ensures an analysis based on up-to-date and accurate information. The alternatives and criteria used in the study are listed in Table 1. In the study, the financial sector is included in two sub-sections as banks and non-banks.

**Table 1. Alternatives and criteria used in the study**

Alternatives	Code	Criteria	Code
All Companies	A1	Number of Companies	C1
Industrial	A2	Shareholders	C2
Financial	A3	Public Disclosure	C3
Financial_Bank	A4	Stakeholders	C4
Financial_Non Bank	A5	Board of Directors	C5
Services	A6		
Technology	A7		

The corporate governance maturity level measurement problem requires making decisions based on more than one decision criterion. For this reason, the CRITIC method was used to determine the objective weights for the decision criteria used in the study. In addition, the ARAS and COPRAS methods were used to evaluate the maturity levels of groups.

### 2.2. CRITIC Method

The CRITIC method (Criteria Importance Through Intercriteria Correlation), developed by Diakoulaki et al. (1995), is a method used to obtain the importance levels of criteria in MCDM problems. The steps of the method are as follows (Jahan et al., 2012; Mestanza & Bakhat, 2023: 95-96):

**Step 1.** Forming the decision matrix.

**Step 2.** Normalizing the decision matrix

$$r_{ij} = \frac{x_{ij} - x_j^{max}}{x_j^{max} - x_j^{min}} \quad \text{For benefit criteria} \quad (1)$$

$$r_{ij} = \frac{x_j^{max} - x_{ij}}{x_j^{max} - x_j^{min}} \quad \text{For cost criteria} \quad (2)$$

**Step 3.** Determining the correlation coefficient among attributes.

**Step 4.** Estimating the standard deviation of each attribute.

$$\rho_{jk} = x = \frac{\sum_{i=1}^m (r_{ij} - r_j^-)(r_{ik} - r_k^-)}{\sqrt{\sum_{i=1}^m (r_{ij} - r_j^-)^2 \sum_{i=1}^m (r_{ik} - r_k^-)^2}} \quad (3)$$

**Step 5.** Calculating The index (H).

$$H_j = \sigma_j \sum_{k=1}^K 1 - r_{jk} \quad (4)$$

**Step 6.** Determining the weights of the attributes.

$$w_j = \frac{H_j}{\sum_{j=1}^n H_j} \quad (5)$$

### 2.3. ARAS Method

In the ARAS method, the utility function values of the alternatives subject to research are compared with the utility function value of the optimal alternative added to the decision problem by the researcher. In summary, it is extremely convenient to evaluate and rank alternatives when using this method. The steps of the ARAS method are given below (Zavadskas and Turskis, 2010: 63-165).

**Step 1.** Forming the decision matrix.

$$X = \begin{bmatrix} x_{01} & x_{0j} & x_{0n} \\ x_{i1} & x_{ij} & x_{in} \\ x_{m1} & x_{mj} & x_{mn} \end{bmatrix}; i = 0,1, \dots, m \quad j = 0,1, \dots, n$$

$$x_{0j} = \max_i x_{ij} \quad \text{For benefit criteria} \tag{6}$$

$$x_{0j} = \min_i x_{ij} \quad \text{For cost criteria} \tag{7}$$

**Step 2.** Normalizing the decision matrix

$$\bar{x}_{ij} = \frac{x_{ij}}{\sum_{i=0}^m x_{ij}} \tag{8}$$

$$x_{ij}^* = \frac{1}{x_{ij}} \tag{9}$$

$$\bar{x}_{ij} = \frac{x_{ij}^*}{\sum_{i=0}^m x_{ij}^*} \tag{10}$$

After the normalized values are calculated, the values are written in the matrix form shown below to obtain the  $\bar{X}$  normalized decision matrix.

$$\bar{X} = \begin{bmatrix} \bar{x}_{01} & \bar{x}_{0j} & \bar{x}_{0n} \\ \bar{x}_{i1} & \bar{x}_{ij} & \bar{x}_{in} \\ \bar{x}_{m1} & \bar{x}_{mj} & \bar{x}_{mn} \end{bmatrix}; i = 0,1, \dots, m \quad j = 0,1, \dots, n \tag{11}$$

**Step 3.** Weighting of normalized decision matrix

$$\hat{X} = \begin{bmatrix} \hat{x}_{01} & \hat{x}_{0j} & \hat{x}_{0n} \\ \hat{x}_{i1} & \hat{x}_{ij} & \hat{x}_{in} \\ \hat{x}_{m1} & \hat{x}_{mj} & \hat{x}_{mn} \end{bmatrix}; i = 0,1, \dots, m \quad j = 0,1, \dots, n \tag{12}$$

**Step 4.** Calculation of optimality function values

$$S_i = \sum_{j=1}^n \hat{x}_{ij} \quad i = 0,1, \dots, m \tag{13}$$

$$K_i = \frac{S_i}{S_0} \quad i = 0,1, \dots, m \tag{14}$$

### 3. FINDINGS

First of all, the importance weights of the criteria were calculated with the CRITIC method. The criterion weights calculated for the remaining years are shown in Table 4. The decision matrix was created for the values of 5 criteria. The decision matrix created for 2023 is shown in Table 2 .

**Table 2. Decision Matrix**

Code	C1	C2	C3	C4	C5
A1	507	90,64	92,92	91,27	83,47
A2	220	90,45	93,26	92,07	83,4
A3	145	91,02	92,55	90,07	83,88
A4	12	93,48	98,33	97,35	88,92
A5	133	90,79	92,03	89,41	83,42
A6	109	90,47	92,89	91,03	83,16
A7	33	90,89	92,47	92,01	83,12

After creating the decision matrix, the normalized values obtained by using Eq. [1] for the benefit criteria and Eq. [2] for the cost criteria are presented in Table 3.

**Table 3. Normalized Decision Matrix**

Code	C1	C2	C3	C4	C5
A1	1,00	0,06	0,14	0,23	0,06
A2	0,42	0,00	0,20	0,34	0,05
A3	0,27	0,19	0,08	0,08	0,13
A4	0,00	1,00	1,00	1,00	1,00
A5	0,24	0,11	0,00	0,00	0,05
A6	0,20	0,01	0,14	0,20	0,01
A7	0,04	0,15	0,07	0,33	0,00

The weight coefficients calculated for 2023 included in the analysis are shown in Table 4.

**Table 4. Weight Coefficients (  $w_j$  )**

Year	C1	C2	C3	C4	C5
2023	0,118	0,219	0,244	0,250	0,169

In Table 4, the weight coefficients of each evaluation criterion for the last step of the CRITIC method are presented using Eq. [5]. As can be seen from Table 4, the most important corporate governance maturity level criterion in 2023 is the "stakeholders" criterion with the C4 code. The least important criterion is the "number of companies" criterion with the C1 code.

According to Eq. [12], each value in the normalized decision matrix is multiplied by the criterion weight values obtained from the CRITIC method to obtain the weighted decision matrix. The weighted decision matrix is shown in Table 5.

**Table 5. Weighted Normalized Decision Matrix**

	C1	C2	C3	C4	C5
<b>Optimal Value</b>	<b>507</b>	<b>93,48</b>	<b>98,33</b>	<b>97,35</b>	<b>88,92</b>
A1	0,0359	0,0271	0,0301	0,0308	0,0208
A2	0,0156	0,0271	0,0302	0,0311	0,0208
A3	0,0103	0,0273	0,0300	0,0304	0,0209
A4	0,0008	0,0280	0,0319	0,0329	0,0222
A5	0,0094	0,0272	0,0298	0,0302	0,0208
A6	0,0077	0,0271	0,0301	0,0307	0,0207
A7	0,0023	0,0272	0,0300	0,0311	0,0207

In the last step, the optimality function values for each alternative are calculated. The benefit levels shown in Table 6 were calculated and listed from largest to smallest and the alternatives were evaluated.

**Table 6. Optimality Function Values and Alternative Rankings**

	$S_i$	$K_i$	% $K_i$	Rank
<b>Optimal Value</b>	<b>0,1508</b>			
A1	0,1448	0,9601	96,01%	1
A2	0,1248	0,8273	82,73%	2
A3	0,1188	0,7880	78,80%	3
A4	0,1157	0,7675	76,75%	4
A5	0,1174	0,7786	77,86%	5

A6	0,1164	0,7717	77,17%	6
A7	0,1113	0,7381	73,81%	7

When we look at the corporate governance maturity level ranking as a result of the ARAS method, the alternatives coded A1, A2 and A3 are in the top three, respectively.

CGML scores can help to better understand the position of alternatives in corporate governance in terms of all relevant factors that can reveal corporate governance performance, especially financial performance, operational effectiveness and sustainability factors. In the sector group-based ranking, the ranking is made starting from the one with the highest score, taking the general grade level as a reference.

Corporate Governance Maturity Level scores calculated by MKK regarding the alternatives are presented in Table 7.

**Table 7. Corporate Governance Maturity Level Scores Calculated by MKK**

Period	Alternatives	Total Score	Rank
2023	All Companies	88,80	3
	Industrial	88,93	2
	Financial	88,76	4
	Financial_Bank	93,68	1
	Financial_Non Bank	88,32	7
	Services	88,60	6
	Technology	88,73	5

According to Table 7, it is seen that the financial bank sector group received the highest rating value in the relevant period. The lowest score belongs to the financial non-bank sector group.

## CONCLUSION

Attracting successful investments to the company in the long term and reducing investment risk for the investor is only possible with effective corporate governance. Sustaining the existence of companies and increasing the competitiveness of their activities is possible with successful corporate governance practices. Therefore, revealing the corporate governance performance of companies is important in this respect. Various methods have been developed to measure companies' corporate governance maturity levels. CGML is the most up-to-date of these methods (Arıkan, 2022: 38). This study focuses on the CGML performance analysis of companies operating in Borsa Istanbul on a sectoral group basis. CGML data calculated by MKK and covering the year 2023 was used in the study. In CGML performance measurement, the CRITIC-based ARAS method, one of the MCDM methods, was used.

The unique aspect of the study is the use of the CRITIC method in the study by integrating it with the ARAS method and the evaluation of the understandability of corporate governance practices with the relevant MCDM method. Therefore, it is considered that the study will contribute to the literature in this aspect.

Five criteria were used in the analysis of the study. These criteria; number of companies, shareholders, stakeholders, board of directors and public disclosure. In the results of the CRITIC method used in criterion weighting, stakeholders ranked first as the criterion with the highest importance level for the relevant year. In Kılıçarslan's (2024) study, the number of companies ranked first as the criterion with the highest importance. In the study conducted by Esen and Yılmaz (2015), public disclosure and transparency criteria are seen as the criteria with the highest score. Therefore, it can be seen that the criterion weighting results of the study generally differ from the results of other studies.

In terms of CGML, in the ARAS method ranking results for 2023, the "services" sector group and the "technology" sector group have the lowest performance in the last two rankings, while "all companies" and the "industrial" sector group are in the first two places in the best performance ranking. In terms of 2023 ranking results, the CGML rankings announced by MKK differ from the ARAS method ranking results. According to MKK, the sector with the highest ranking is "financial bank", while the sector with the lowest ranking is "financial non bank".

The findings obtained from the study are limited to the criteria and methods used for CGML. It should be noted that only the ARAS method was used in the alternative rankings in the study. In future studies on CGML, different results may be obtained by using different methods.

### **Conflict of Interest Statement**

"The author of this article is also an associate editor of this journal. This situation is considered a relationship that may create a conflict of interest. In order to ensure an impartial and transparent peer review process, the peer review and publication decision on this article was conducted by another member of the journal's editorial team. Blind peer review was applied during the evaluation process of the article and the author's editorial position was not disclosed to the reviewers. In addition, all stages of this process were managed in accordance with the journal's ethical rules and international ethical guidelines such as COPE and ICMJE to prevent conflicts of interest."



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