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# AHP METODUYLA ENTEGRE RAPORLAMA ENDEKSI OLUŞTURULMASINA YÖNELİK BİR MODEL ÖNERİSİ

## *CREATING AN INTEGRATED REPORTING INDEX USING THE AHP METHOD: MODEL DEVELOPMENT AND APPLICATION* [1]

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**ABSTRACT**

*This study aims to develop an index to assess the value creation capabilities of organizations and companies. To achieve this, an "Integrated Reporting Index" (IRI) was constructed through a modeling approach specific to integrated reporting. Based on the analysis results, the IRI emerged as the most significant indicator in evaluating the measures taken to mitigate or manage key risks and capitalize on strategic opportunities. These measures include the identification of strategic goals, formulation of strategies and policies, setting of targets, and the use of key performance indicators—accounting for 12.3% of the total 39 indicators identified. Other indicators were found to contribute at comparatively lower levels Despite growing interest from both practitioners and scholars in the evolution of corporate reporting toward integrated and sustainability reporting, there has been no prior study dedicated to the development of an index specifically for integrated reporting. This research, therefore, seeks to address this gap by offering a novel contribution to the academic literature as well as to investment and corporate practices.*

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**ÖZET**

*Bu çalışma, örgütlerin ve şirketlerin değer yaratma yetkinliklerini ölçmeye olanak tanıyan bir endeks geliştirmeyi amaçlamaktadır. Bu doğrultuda, Analitik Hiyerarşik Süreci (Analytical Hierarchical Process-AHP) araştırma yöntemi kullanılarak Entegre Raporlama Endeksi Modellemesi uygulanmış ve "Entegre Raporlama Endeksi" (IRI) oluşturulmuştur. Analiz bulguları sonucunda; stratejik hedeflerin belirlenmesi, stratejiler, politikalar, hedefler ve kilit performans göstergelerinin tanımlanması dâhil olmak üzere, temel riskleri azaltmaya veya yönetmeye yönelik alınan önlemler ile stratejik fırsatlardan değer yaratma çabalarını değerlendiren en önemli gösterge olarak belirlenmiştir. Bu gösterge, toplam 39 göstergenin %12,3'ünü oluşturmaktadır. Diğer göstergeler ise daha düşük oranlarda katkı sağlamıştır. Kurumsal raporlamanın geliştirilmesine katkı sağlamak üzere bir entegre raporlama endeksi modellemesi daha önce hiçbir çalışmada yapılmamıştır. Bu bağlamda, söz konusu çalışma, hem akademik literatüre hem de yatırım ve iş dünyası uygulamalarına katkı sunarak bu boşluğu doldurmayı hedeflemektedir*

## 1. INTRODUCTION

The concept of value creation, which has become the most important problem of this age, has been the subject of research in many fields and disciplines, contributing to the development of many concepts and principles, and it also laid the foundation for the formation of Integrated Reporting (IR), which is the last point of corporate reporting in the field of accounting and finance.

Gaining an accurate insight into the assets of companies in every sense, material and moral, and how to follow a strategy to create value beyond their time with these assets becomes the main factor affecting the decision-making process of investors. In this regard, studies carried out from the past to the present revealed that the components of the market value of the companies changed in favor of the intangible assets, including the perception of the future value created by the market and all other factors, and the phenomenon of IR emerged as a projection of meeting this need (IIRC, 2011; oceantomo.com, 2020; SAICA, 2015). At this point, increasing the quality of information transferred to financial capital providers is the most important factor that allows for a more rational distribution of capital and increases production (Lakshan A.M.I. at al., 2021; Maroun W. et al., 2022). Hence, IR brings a vital innovation in terms of creating different reporting options for corporate reporting and presenting a more effective and integrated approach that includes all elements that affect the ability of organizations to create value in the process.

This study aimed to create an "*Integrated Reporting Index*" in which the potential of the value created by the organizations in the present and future can be measured, and the changes in the stability of this value can be observed to help the investors and then all stakeholders to evaluate the future value creation potential of the companies. In order to create an integrated reporting index, the criteria that determine the index and the metrics that constitute the basis for measuring them were created. These metrics determine the set of values that the relevant criterion can take. Hence, the expert opinions obtained after the index criteria were evaluated by the experts were included in the coding and analysis process with the analytical hierarchical process (AHP) research method. Finally, an "Integrated Reporting Index (IRI)" was created through Integrated Reporting Index Modeling.

IRI is significant in terms of enabling organizations to compare their value creation capabilities and performance on both local and global platforms. Thus, IRI becomes a key tool that enables the information obtained by financial capital providers to evolve into higher quality, more comprehensive, and timely information while enabling a more rational distribution of capital and increasing production.

The remainder of this study is organized as follows: Section 2 reviews the relevant existing literature, while Section 3 presents the proposed framework and the research framework. The analyses of the AHP results are described in Section 4, followed by a discussion of the study implications in Section 5.

## 2. LİTERATURE REVİEW

The changing and increasing speed of the global world from past to present has led to an increase in the sensitivity of environmental, social, and economic factors to each other, as well as a dynamic transformation of people's demands and expectations in parallel with social awareness and developments. This situation has led to a rapid increase in the areas in which corporate reporting interacts in the context of the social sciences discipline, thus expanding the scope and content of reporting. IR is the ultimate point of Corporate Reporting today, in reference to this expanding scope and integrating and concise all the information related to the content. IR is also defined as a process built on the philosophy of Integrated Thinking that results in the publication of all communications associated with the elements of the value creation process of an integrated report on the value created by an organization over time (IIRC, 2013). How IR will take shape and develop within an organization in the short, medium, and long term is related to how that organization focuses on financial profits and the environment and all stakeholders together with capital providers (Adams, 2015; Karaburun and Demirci, 2020). Therefore, the main focus of IR is to explain the needs of not only shareholders but also stakeholders and how future value is created and sustainable for the business itself and the society affected by it (Güldoğan, 2020; Okwuosa and Atkins, 2022).

In essence, IR helps a company demonstrate its value creation process with transparency and honesty. Such a report demonstrates how forward-looking information, along with financial information, coordinates the company's capacity to explain its strategic direction, objectives, risks, and opportunities. For this reason, the structure and length of the reports presented vary depending on the unique structural characteristics and complexity of the organizations. The primary purpose of IR in the Integrated Reporting Framework is defined as "*the primary purpose of an integrated report is to explain to financial capital providers how an organization will create value over time*." Therefore, it contains relevant information on both financial and other issues. In the aforementioned framework, the primary users of IR are defined as "parties providing financial capital," but it is basically aimed that all social stakeholders can benefit from integrated reports.

As it is known, the International Integrated Reporting Council (IIRC) continues its work with the mission of preparing an Internationally Accepted Integrated Reporting Framework. The council is a global coalition of regulators, investors, companies, standard setters, the accounting profession, academia, and non-governmental organizations (Non-Governmental Organizations-NGO). This coalition is of the opinion that communication about value creation, conservation, or erosion should be the next step in the evolution of corporate reporting (IIRC, 2020).

In the projection of these developments, many studies have been carried out both to understand the IR phenomenon and detect the problems experienced in practice. In particular, the concept of integrated thinking and how well companies understand the guiding principles while preparing integrated reports have been the subject of many studies (Lai et al., 2018; Okwuosa and Atkins, 2022).

The current literature shows that integrated thinking is problematic in practice due to the ambiguity of the concept of such thinking and a lack of understanding of how it works (Dumay et al., 2017; Feng et al., 2017; Maroun W. et al., 2022; Okwuosa and Atkins, 2022). Recent stakeholder feedback to IIRC has made it clear that organizations are struggling most with integrated thinking, and therefore, integrated thinking has been given wide coverage in the IR Framework revised in 2021. Besides, the concept of materiality is well established and tested for the quantitative elements of financial reporting, but it is less understood for the qualitative elements that are more common in an environmental or social context (Abhayawansa et al., 2019; Adams and Simnett, 2011). Non-financial KPIs are important for maintaining investor confidence, but many companies have difficulties preparing them because the material can neither be generalized nor standardized (Azam et al., 2011). Ultimately, the distinction between "intangible" and "material" that crosses the materiality threshold for inclusion in an integrated report is decided by the entity reporting the "material" (Eccles and Krzus, 2015).

However, the current literature identifies that the significance of IR is not clearly expressed or understood and that there is limited academic research published on materiality in IR to date (IAAER and IIRC, 2016; integratedreporting.org, 2022; Lai et al., 2017; Paternostro, 2020). However, in practice, the importance of sustainability information is extremely difficult to determine, and more research is needed (ACCA, 2012; Adams, 2004; Beske et al., 2020; Cerbone and Maroun, 2020; Okwuosa and Atkins, 2022). Eventually, determining materiality is key to increasing organizations' ability to create value effectively and rapidly. Therefore, this study aims to create an index that allows measuring the value creation capabilities of organizations/companies and guides each organization to create its own materiality layers, thus filling the gap in the literature.

It is understood that the lack of a common understanding of the purpose of the IR and the questioning of the suitability of the new report format is the biggest challenges in the implementation of the IR. It focuses on an organization's ability to create value in the short, medium, and long term. While doing this, it puts a combined emphasis on substance, strategic focus, future direction, the connection of knowledge, capital, and interdependencies. In many studies conducted to date, it is reported that there are difficulties in establishing a connection between non-financial indicators and financial results. Additionally, information systems and processes that are insufficient to provide reliable information appear to be a major problem in implementing IR. However, few studies to date have included research to guide the development of appropriate information systems. On the other hand, the existence of an IRI will take the formation of IR one step further, and for companies, it is expected to make a great contribution to the consolidation of a basic stage, such as catching a standard in the understanding of the integrated reporting framework. In this respect, it is important that the study fills the gap in the literature

## 3. PURPOSE AND METHOD OF THE STUDY

This research aims to create an index where the changes in the quality and stability of the Integrated Reports prepared for the purpose of reporting and analyzing the value-creation processes of the organizations can be observed. In order to create this index, first of all, the variables affecting the phenomenon of value creation were examined. In this context, a detailed literature review was conducted, and the most prominent indicators in studies conducted internationally in various international standards were examined. The International Integrated Reporting Framework Content Elements were primarily referenced in determining IRI's Main Criteria and Sub-Criteria.

After the IRI criteria and the metrics that constitute the basis for measuring them were established, the importance of the evaluation criteria relative to each other, in other words, their degree of dominance or how preferable they are, was determined. In scoring, the expert opinions obtained as a result of the evaluations by the most authoritative decision-making bodies of the institutions that prepare integrated reporting in Turkey (Çimsa Çimento Sanayi ve Ticaret A.Ş., Garanti Bank, Argüden Governance Academy, Aslan Cement, Borsa İstanbul and Yıldız Technical University Finance, Corporate Governance, and Sustainability Research Center) was used.

There are many different methods used to calculate indicator weights. Within the scope of this study, the Analytical Hierarchy Process (AHP) model, which is one of the Multi-Criteria Decision Making-MCDM Techniques, was used. Both the function of synthesizing many factors in a hierarchy and the function of considering the qualitative criteria used in the measurement of non-financial indicators determined AHP as a powerful method in the measurements made for the problem determined within the scope of the research. AHP was developed by Professor Thomas L. Saaty in the 1970s. In essence, the most important function of AHP is to model many factors in a hierarchy (Saaty, 2016).

Thus, Integrated Reporting Index Modeling was carried out to determine which indicator affects IR and how, and then the final goal, IRI, was created. Detailed information about the AHP Method is given below.

Developed by Professor Thomas L. Saaty in the 1970s and continued to be studied extensively since then, AHP, as the name suggests, is a method of solving complex decision-making based on alternatives and multiple criteria. At the same time, it is an intuitive technique created for the evaluation, analysis, and calculation of decisions (Güngör & Didar, 2012).

Each decision-making style leads to significant differences in the decision-making process. In this case, the basis of the decisions taken and the decision-making method have priority (Usul, 2007). AHP evaluates the importance of alternatives and evaluation criteria, their degree of dominance, or how preferable they are to each other through pair-wise comparisons, which are a part of human nature. In this sense, the opinions of the decision maker are needed when determining the relative importance levels and all evaluation criteria. The most important feature of AHP is that it is a system where a large number of decision-makers can include their objective and subjective thoughts together in the decision process while choosing or ranking among a large number of alternatives, that is, both qualitative and quantitative information (thoughts) can be used in the decision-making process in the decision problem. Another important feature of AHP is that it allows for the measurement of the degree of consistency of decision-maker choices. In other words, AHP makes it possible to evaluate the consistency of pair-wise comparisons made by the decision maker among the criteria. In this regard, AHP performs sensitivity analysis within itself (Göral, 2015).

The AHP method consists of 6 (six) stages.

Stage One: Developing the Hierarchical Structure

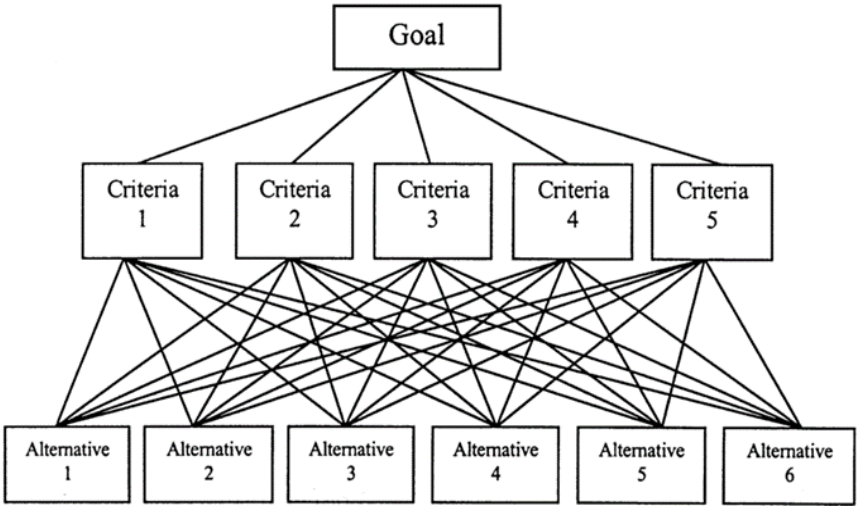


**Figure 1.** The hierarchical structure of AHP

**Source***:* Saaty, Thomas L. "The seven pillars of the analytic hierarchy process." Multiple criteria decision making in the new millennium. Springer, Berlin, Heidelberg, 2001. 15-37.

Figure 1 shows the Hierarchical Structure of the Analytical Hierarchy Process. First of all, it is necessary to determine the purpose of the decision-making problem, that is, to define the decision-making problem. In order to achieve this goal, all decision criteria (including sub-criteria) to be used in the solution of the problem should be determined, and possible decision alternatives should be created. After that, a hierarchical structure for the relevant decision problem is established, as seen in the figure above.

**Second Stage:** Making Pair-wise Comparisons of the Criteria and Establishing the Comparison Matrix

Current literature frequently uses Saaty's 1-9 scale in pair-wise comparison matrices. In comparing the main criteria and sub-criteria, decision-makers evaluate these criteria using Saaty's 1-9 scale.

Saaty's scale used in the pair-wise comparison is shown in Table 1. As can be seen from this table, all comparison values (degrees) are taken as positive.

**Table 1.** The 1 to 9 scale for AHP pair-wise comparison

| **Intensity of importance** | Definition | **Explanation** |
|---|---|---|
| **1** | Equal importance | Two criteria contribute equally to the objective of waste reduction |
| **3** | Moderate importance | Judgment slightly favors one over another |
| **5** | Strong importance | Judgment strongly favors one over another |
| **7** | Very strong importance | A criterion is strongly favored, and its dominance is demonstrated in practice |
| **9** | Absolute importance | The importance of one over another affirmed in the highest possible order |
| **2, 4, 6, 8** | Intermediate values | Used to represent a compromise between the priorities listed above |

**Source**: Saaty, Thomas L."The analytic hierarchy and analytic network measurement processes: applications to decisions under risk" European journal of pure and applied mathematics 1.1 (2007): 122-196

A matrix is formed depending on the pair-wise comparison judgments of the criteria. The value of the diagonal elements of the created comparison matrix is 1.

The general structure of the comparison matrix is shown in Table 2. The criteria are formed according to the relative importance weights/degrees of n criteria, including n, n, ....., n and their weights w, w, ....., w.

**Table 2.** Creating the pair-wise comparisons matrix for the criteria

| | **Criteria 1** | **Criteria 2** | **.....** | **Criteria n** |
|---|---|---|---|---|
| **Criteria 1** | W1/W1 | W1/W2 | ..... | W1/Wn |
| **Criteria 2** | W2/W1 | W2/W2 | ..... | W2/Wn |
| **.....** | ..... | ..... | ..... | ..... |
| **Criteria n** | Wn/W1 | Wn/W2 | ..... | Wn/Wn |

**Source**: Poveda, Cesar A., and Michael G. Lipsett."Weighting sustainable development indicators (SDIs) for surface mining operations using the analytical hierarchy process (AHP)" Int. J. Anal. Hierarchy Process 5.2 (2013).

**Third Stage:** Calculation of Significance / Priority Values (Weights) of Criteria with Eigenvector Calculation

At this stage, criteria weights are calculated by means of eigenvector calculation. In the eigenvector calculation, first of all, the comparison matrix (pair-wise comparison matrix) created for the criteria is standardized. In other words, the normalization process (column normalization) is applied.

The mathematical expression of the normalization process is as follows:

$$n_{ij} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}$$

In order to calculate the priority values (weights) of the criteria after the normalized matrix is obtained, row averages are taken in the normalized matrix, and the eigenvector is calculated. The mathematical expression of this process is as follows:

$$w_i = \frac{\sum_{j=1}^{n} N_{ij}}{n}$$

The eigenvector (W) represents the weights of the criteria, and its mathematical expression is as follows:

$$W = \begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ \vdots \\ w_n \end{bmatrix}$$

**Fourth Stage:** Making Pair-wise Comparisons for All Alternatives Based on Criteria and Calculating Importance Weights/Priority Values

At this stage, all the same, calculations made for the criteria in the second and third stages are made for the alternatives on the basis of individual criteria; that is, after calculating the pair-wise comparisons of all alternatives according to the criteria, the eigenvector is calculated accordingly. Thus, the priority values (weights) of the alternatives are obtained.

**Fifth Stage:** Calculating the Consistency Ratio (C. R.)

If the comparison matrix values are inconsistent, the established matrix loses its validity; in other words, the weights obtained cannot be used. For this, after calculating the importance weights of the criteria, the consistency of the comparison matrix is calculated.

The consistency of weights obtained by calculating the Consistency Ratio (C. R.) and pair-wise comparisons between items are tested.

The formula for calculating the consistency ratio is as follows:

$$C.R. = \frac{C.I.}{R.I.}$$

Where C.I. value represents "Consistency Index" and R.I. stands for "Randomness/Random Index."

The calculation formula of the consistency index C.I. is as follows:

$$C.I. = \frac{\lambda_{max} - n}{n - 1}$$

The greatest eigenvalue is represented as "$\lambda max$" while the number of items is expressed as "n" If the number of items is used to measure the consistency of the criterion weights, the number represents the number of criteria; if it is used to measure the consistency of the alternative weights, the number represents the number of alternatives.

The random index values developed for matrices ranging in size from 1 to 15 are shown in Table 6. A consistency ratio (C.R.) of less than 0.1 (i.e., less than 10%) indicates that the results are reliable and realistic. In other words, it shows that the results are consistent.

**Table 3.** Random index

| n | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RI | 0.00 | 0.00 | 0,52 | 0,89 | 1,11 | 1,25 | 1,35 | 1,4 | 1,45 | 1,49 | 1,51 | 1,54 |

**Source**: Tzeng, Gwo-Hshiung, and Jih-Jeng Huang. Multiple attribute decision making: methods and applications. CRC Press, 2011.

A consistency ratio (C.R.) above 0.1 (i.e., above 10%) indicates that the results are unreliable and unrealistic. In other words, it shows that the results are not consistent and require rechecking the pair-wise comparison values obtained until the consistency ratio drops below 10%.

**Sixth Stage:** Finding the Highest Value Alternative

At the last stage, the importance weights of each criterion in the lowest step of the hierarchy are calculated for the decision problem, and the importance weight of each alternative is calculated. The sum of the importance weights of the alternatives is equal to 1, and the alternative with the highest value among them is selected. This choice becomes the optimal alternative for the decision problem.

## 4. APPLICATION OF AHP METHOD IN CREATING IRI

In the first stage of the methodology of the study, it was tried to determine the IRI Criteria to be created. In this context, a detailed literature review was conducted, and the most prominent indicators in studies conducted internationally in various international standards were examined. Decision criteria determined for the purpose of the problem consist of main criteria and sub-criteria, and the International Integrated Reporting Framework Content Elements were taken as a basis in determining the Main Criteria and Sub-Criteria of the IRI.

The main criteria are the organizational overview and external environment, corporate governance, business model, risks and opportunities, strategy and resource allocation, performance, outlook, and basis of preparation and presentation. Indicators determined as "IRI Criteria," in other words, sub-criteria, are shown in Table 4 with their notations.

**Table 4.** Decision criteria (IRI criteria)

| Main Criteria | Notation | Sub-criteria | Notation |
|---|---|---|---|
| Organizational Overview and External Environment | K1 | Organization's culture, ethical principles, and values | K1.1 |
| | | Ownership and operating structure of the organization | K1.2 |
| | | The organization's core activities and markets | K1.3 |
| | | Competitive structure and market position of the organization | K1.4 |
| | | The organization's position in the value chain | K1.5 |
| | | Important quantitative information highlighting the major changes experienced by the organization compared to previous periods | K1.6 |
| | | Important factors influencing the organization's external environment and the organization's response | K1.7 |
| Governance | K2 | Skills and different aspects of corporate governance officers | K2.1 |

| | | | |
|---|---|---|---|
| | | Specific processes used to create and monitor the organization's culture, including making strategic decisions and the organization's approaches to the mechanisms it uses to address risk, integrity, and ethical issues | K2.2 |
| | | Measures taken by corporate governance officers to determine and monitor the strategic direction of the organization and its approach to risk management | K2.3 |
| | | How the organization's culture, ethical principles, and values are reflected in its use and influencing of capital, including relationships with key stakeholders | K2.4 |
| | | Important factors influencing the organization's external environment and the organization's response | K2.5 |
| | | Whether the organization carries out corporate governance practices that exceed legal requirements | K2.6 |
| | | Responsibility of corporate governance officers to encourage and implement innovation | K2.7 |
| | | How wages and incentives are linked to value creation in the short, medium, and long term and how they affect the organization's use and impact of its capitals | K2.8 |
| Business Model | K3 | A clear explanation of the key elements of the business model | K3.1 |
| | | A logical flow of message appropriate to the context of the organization | K3.2 |
| | | Clarification on key stakeholders and other dependencies (e.g., raw materials) and key factors affecting the external environment | K3.3 |
| | | Links to information covered under other content elements such as strategy, risk and opportunities, and performance (financial issues such as cost reduction and revenues, etc.) | K3.4 |
| Risks and Opportunities | K4 | The organization identifies specific sources of risks and opportunities (internal, external, or commonly a mix of the two) and describes these sources, including their impact on capital and their availability, quality, and affordability. | K4.1 |
| | | The organization's assessment of the likelihood of the risk or opportunity occurring and the magnitude of the impact if it does, taking into account the specific circumstances that led to the risk or opportunity being realized (there will always be some degree of uncertainty in such disclosure). | K4.2 |
| | | Actions taken to mitigate or manage key risks or create value from key opportunities, including setting associated strategic objectives, strategies, policies, objectives, | K4.3 |

| | | | |
|---|---|---|---|
| | | and KPIs | |
| Strategy and Resource Allocation | K5 | The organization's short, medium, and long-term strategic goals and the strategies it implements or plans to implement to achieve these strategic goals | K5.1 |
| | | Resource transfer plans needed to implement its strategy | K5.2 |
| | | How to measure achievements and targeted results in the short, medium, and long term | K5.3 |
| | | The link between the organization's strategy and resource allocation plans and the information covered by other content items | K5.4 |
| | | Differentiation factors that enable the organization to have a competitive advantage and create value (the role of innovation is how the organization develops and uses its intellectual capital, the extent to which environmental and social considerations are incorporated into the organization's strategy to gain a competitive advantage) | K5.5 |
| | | Key features and findings of stakeholder interaction used in formulating strategy and resource allocation plans | K5.6 |
| Performance | K6 | Descriptions of qualitative indicators in terms of objectives and risks and opportunities, their significance, impact, and the methods and assumptions used in their creation | K6.1 |
| | | Disclosures about the effects (positive and negative) on the capital of the organization, including the effects on the capital upstream and down the value chain | K6.2 |
| | | Descriptions of the status of key stakeholder relationships and how the organization is responding to the legitimate needs and wishes of key stakeholders | K6.3 |
| | | Disclosures about the links between past and current performance, and between current performance and the organization's outlook | K6.4 |
| Outlook | K7 | The organization's expectations about the situations likely to be encountered in its external environment in the short, medium, and long term. | K7.1 |
| | | Statements about how this will affect the organization | K7.2 |
| | | How the organization is organized to respond to the critical challenges and uncertainties currently facing it | K7.3 |

| | | | |
|---|---|---|---|
| Basis of Preparation and Presentation | K8 | Disclosures regarding the organization's materiality determination process | K8.1 |
| | | An explanation of the reporting limit and how it is determined | K8.2 |
| | | How the organization is organized to respond to the critical challenges and uncertainties currently facing it | K8.3 |
| | | A summary of the major frameworks and methods used to qualify or evaluate material issues | K8.4 |

The survey form prepared in the format to be used in the AHP method was evaluated by the most authorized decision-making bodies of the institutions preparing IR in Turkey through the Survey Monkey electronic portal, and then the expert opinions obtained were included in the coding and analysis process with the AHP research method.

The main criteria were first evaluated by the decision makers using Saaty's 1-9 scale, and as a result, pair-wise comparison matrix values were created. In order to calculate the eigenvector from the pair-wise comparison matrix values of the main criteria, first of all, the normalized matrix (column normalization) was obtained, and then the row averages in this matrix were taken, and the eigenvector was found. Thus, the weights of the criteria were calculated through the eigenvector calculation.

The same process of obtaining the pair-wise comparison values between the criteria, forming the pair-wise comparison matrix, and finding the priority values of the criteria was applied separately for each sub-criterion. At the same time, the consistency ratio (CR) of the values of all criteria is calculated, and this ratio is used to measure the consistency of the pair-wise comparison matrix.

Table 5 presents the geometric means of the pair-wise comparisons of the eight main integrating reporting index criteria. After completing the (8x8) pair-wise comparison, we apply the AHP method to determine the weights of relative importance for each criterion (the priority vector of Table 5).

**Table 5.** Geometric means of pair-wise comparison of main criteria

| *Geometric means of pair-wise comparison of main criteria* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Criteria | K1 | K2 | K3 | K4 | K5 | K6 | K7 | K8 | Priority vector |
| K1 | **1** | 1/2 | 1/2 | 1/3 | 1/3 | 1/2 | 1 | 3 | 0.07 |
| K2 | | **1** | 1 | 1 | 1 | 1/2 | 1 | 5 | 0.11 |
| K3 | | | **1** | 1/2 | 1 | 1/3 | 2 | 5 | 0.11 |
| K4 | | | | **1** | 3 | 1 | 5 | 6 | 0.22 |
| K5 | | | | | **1** | 1/3 | 2 | 5 | 0.12 |
| K6 | | | | | | **1** | 5 | 7 | 0.25 |
| K7 | | | | | | | **1** | 2 | 0.06 |
| K8 | | | | | | | | **1** | 0.02 |
| CR Value: 0.04<0.10 (consistent) | | | | | | | | | |

Accordingly, as a result of the pair-wise comparison values of the main criteria, it is seen that the main performance criterion (K6) is the most effective main criterion in the formation of IRI, with 25.0%. Then, the main criterion of risk and opportunities (K4) comes to the fore with 22.8%. Respectively, the main criteria of strategy and resource allocation (K5) were 12.1%; the corporate governance main criterion (K2) was 11.8%; the business model main criterion (K3) was 11.6%; the main criterion of general institutional appearance and external framework (K1) is 7.7%, and the main criterion of general appearance (K7) was 6.3%. According to experts, the least effective main criterion in creating the IRI is the preparation and presentation basis main criterion (K8) with 2.7%. Finally, the consensus responses in Table V noticeably fulfill an acceptable CR requirement of the AHP model with a CR value of 4%.

To better understand the priority weights reported in Table V for the main integrating reporting index categories, a similar approach was taken to establish a pair-wise comparison of the sub-criteria within each category. Prioritizing these criteria within each main category is essential for a more accurate result, leading to more effective integrating reporting index implementation.

Clearly, this sub-criteria needs to be addressed, not the main categories, and setting the right priority will help stakeholders, especially investors, to use an index that accurately measures the value of companies or their Integrated Value Creation (IVC) performance. The AHP results for the eight pair-wise matrices are presented in Table 6.

**Table 6.** Geometric means of pair-wise comparison of sub-criteria

*Geometric means of pair-wise comparison of sub-criteria (Organizational Overview And External Environment)*

| Criteria | K1.1 | K1.2 | K1.3 | K1.4 | K1.5 | K1.6 | K1.7 | Priority vector |
|---|---|---|---|---|---|---|---|---|
| K1.1 | **1** | 5 | 7 | 3 | 1/3 | 1/3 | 1/4 | 0.16 |
| K1.2 | | **1** | 1/2 | 1/2 | 1/5 | 1/4 | 1/4 | 0.03 |
| K1.3 | | | **1** | 1/2 | 1/5 | 1/4 | 1 | 0.04 |
| K1.4 | | | | **1** | 1/4 | 1/2 | 1 | 0.11 |
| K1.5 | | | | | **1** | 2 | 2 | 0.24 |
| K1.6 | | | | | | **1** | 2 | 0.17 |
| K1.7 | | | | | | | **1** | 0.22 |

CR Value: 0.09<0.10 (consistent)

*Geometric means of pair-wise comparison of sub-criteria (Governance)*

| Criteria | K2.1 | K2.2 | K2.3 | K2.4 | K2.5 | K2.6 | K2.7 | K2.8 | Priority vector |
|---|---|---|---|---|---|---|---|---|---|
| K2.1 | **1** | 1/4 | 1/6 | 4 | 1/4 | 1/3 | 1/3 | 1/6 | 0.04 |
| K2.2 | | **1** | 2 | 1 | 2 | 2 | 2 | 1 | 0.16 |
| K2.3 | | | **1** | 1/4 | 1 | 2 | 1 | !/2 | 0.08 |
| K2.4 | | | | **1** | 2 | 2 | 1 | 1/2 | 0.17 |
| K2.5 | | | | | **1** | 1 | 1 | 1/3 | 0.09 |
| K2.6 | | | | | | **1** | 1/3 | 1/2 | 0.08 |
| K2.7 | | | | | | | **1** | 1/3 | 0.11 |
| K2.8 | | | | | | | | **1** | 0.23 |

CR Value: 0.06<0.10 (consistent)

*Geometric means of pair-wise comparison of sub-criteria (Business Model)*

| Criteria | K3.1 | K3.2 | K3.3 | K3.4 | Priority vector |
|---|---|---|---|---|---|
| K3.1 | **1** | 4 | 1/3 | 1/3 | 0.15 |
| K3.2 | | **1** | 1/7 | 1/5 | 0.05 |
| K3.3 | | | **1** | 1 | 0.40 |
| K3.4 | | | | **1** | 0.37 |

CR Value: 0.03<0.10 (consistent)

*Geometric means of pair-wise comparison of sub-criteria (Risks and Opportunities)*

| Criteria | K4.1 | K4.2 | K4.3 | Priority vector |
|---|---|---|---|---|
| K4.1 | **1** | 2 | 1/2 | 0.29 |
| K4.2 | | **1** | 1/3 | 0.16 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| K4.3 | | | **1** | | | | 0.54 |
| CR Value: 0.01<0.10 (consistent) | | | | | | | |

*Geometric means of pair-wise comparison of sub-criteria (Strategy and Resource Allocation)*

| Criteria | K5.1 | K5.2 | K5.3 | K5.4 | K5.5 | K5.6 | Priority vector |
|---|---|---|---|---|---|---|---|
| K5.1 | **1** | 2 | 1/2 | 1/2 | 1/2 | 1/2 | 0.10 |
| K5.2 | | **1** | 1/3 | 1/2 | 1/4 | 1/2 | 0.06 |
| K5.3 | | | **1** | 2 | 1/3 | 1/2 | 0.17 |
| K5.4 | | | | **1** | 1 | 1/2 | 0.15 |
| K5.5 | | | | | **1** | 2 | 0.29 |
| K5.6 | | | | | | **1** | 0.21 |
| CR Value: 0.06<0.10 (consistent) | | | | | | | |

*Geometric means of pair-wise comparison of sub-criteria (Performance)*

| Criteria | K6.1 | K6.2 | K6.3 | K6.4 | Priority vector |
|---|---|---|---|---|---|
| K6.1 | **1** | 1/3 | 1 | 1/3 | 0.14 |
| K6.2 | | **1** | 1 | 1 | 0.30 |
| K6.3 | | | **1** | 1 | 0.24 |
| K6.4 | | | | **1** | 0.30 |
| CR Value: 0.06<0.10 (consistent) | | | | | |

*Geometric means of pair-wise comparison of sub-criteria (Outlook)*

| Criteria | K7.1 | K7.2 | K7.3 | Priority vector |
|---|---|---|---|---|
| K7.1 | **1** | 1/2 | 1 | 0.25 |
| K7.2 | | **1** | 2 | 0.50 |
| K7.3 | | | **1** | 0.25 |
| CR Value: 0.00<0.10 (consistent) | | | | |

*Geometric means of pair-wise comparison of sub-criteria (Basis of Preparation and Presentation)*

| Criteria | K8.1 | K8.2 | K8.3 | K8.4 | Priority vector |
|---|---|---|---|---|---|
| K8.1 | **1** | 2 | 1 | 1 | 0.29 |
| K8.2 | | **1** | 1 | 1 | 0.21 |
| K8.3 | | | **1** | 1 | 0.24 |
| K8.4 | | | | **1** | 0.24 |
| CR Value: 0.02<0.10 (consistent) | | | | | |

Table 6 shows the priority weights of the consensus pair-wise comparison for the sub-criteria in the "Organizational Overview and External Environment" category. As a result of the comparison values, it is seen that the position of the organization in the value chain with 24.8% is the first main criterion, the general corporate appearance, and the sub-criteria that most affect the external framework. Then, the important factors affecting the organization's external environment and the organization's response, respectively, were 22.3%; significant quantitative information highlighting the major changes in the organization compared to previous periods 17.4%; the organization's culture, ethical principles, and values 16%; competitive structure and market position of the organization 11.9%, and the main activities and markets of the organization come with the rate of 4.2% and finally 3.4% of the ownership and operating structure of the organization. Table 5 also shows that the "Organizational Overview and External Environment" sub-criteria weight assessment meets the AHP consistency requirement with a CR of 9%.

Next, the table provides the priority weights of the consensus pair-wise comparison for the "Business Model" sub-criteria. Accordingly, as a result of the pair-wise comparison values of the sub-criteria affecting the business model main criterion, the sub-criteria about the clarification on key stakeholders and other

dependencies (e.g., raw materials) and key factors affecting the external environment with 40.16% and links to information covered under other content elements such as strategy, risk and opportunities, and performance (financial issues such as cost reduction and revenues, etc.) with 39.9% are two criteria that affect the business model criteria the most. They are followed by a clear explanation of the key elements of the business model with 15.9% and the logical flow of message appropriate to the context of the organization with 5.6%. The Business Model sub-criteria weights assessment meets the AHP consistency requirement with a CR value of 1%. Ff

The priority weights of the consensus pair-wise comparison for the "Risks and Opportunities" sub-criteria are shown as well. Accordingly, as a result of the pair-wise comparison values of the sub-criteria that affect the risks and opportunities main criteria, it was found that the sub-criteria of actions taken to mitigate or manage key risks or create value from key opportunities, including setting associated strategic objectives, strategies, policies, objectives, and KPIs with 54% is the most important sub-criteria affecting the main criteria of risks and opportunities. Then, respectively comes the sub-criterion that the organization identifies specific sources of risks and opportunities (internal, external, or commonly a mix of the two) and describes these sources, including their impact on capital and their availability, quality, and affordability, with 29.7% and the sub-criterion of the organization's assessment of the likelihood of the risk or opportunity occurring and the magnitude of the impact if it does, taking into account the specific circumstances that led to the risk or opportunity being realized (there will always be some degree of uncertainty in such disclosure) with 16.3%. The "Risks and Opportunities" sub-criteria weights assessment meets the AHP consistency requirement with a CR of 1%.

Next, the table provides the priority weights of the consensus pair-wise comparison for the "Strategy and Resource Allocation" sub-criteria. Accordingly, as a result of the pair-wise comparison values of the sub-criteria affecting the main criteria of strategy and resource allocation, the sub-criterion of the differentiation factors that enable the organization to have a competitive advantage and create value (the role of innovation is how the organization develops and uses its intellectual capitals, the extent to which environmental and social considerations are incorporated into the organization's strategy to gain a competitive advantage) with %29,2 is the most important sub-criteria affecting the main criterion of strategy and resource allocation. Then, respectively it is followed by the criterion of Key features and findings of stakeholder interaction used in formulating strategy and resource allocation plans with 21.2%, how to measure achievements and targeted results in the short, medium, and long term with 17.1%, the link between the organization's strategy and resource allocation plans and the information covered by other content items (risks and opportunities) with 15.4%, and the organization's short, medium, and long-term strategic goals and the strategies it implements or plans to implement to achieve these strategic goals with 10.3%. Finally, with 6.8%, the sub-criteria of Resource transfer plans needed to implement its strategy is listed as the sub-criteria with the least impact on the main criterion of strategy and resource allocation. The "Strategy and Resource Allocation" sub-criteria weights assessment meets the AHP consistency requirement with a CR of 6%.

The table provides the priority weights of the consensus pair-wise comparison for the "Performance" sub-criteria. Accordingly, as a result of the analysis of the pair-wise comparison values of the sub-criteria affecting the main performance criterion, the sub-criteria of the disclosures about the effects (positive and negative) on the capitals of the organization, including the effects on the capitals upstream and down the value chain and the disclosures about the links between past and current performance, and between current performance and the organization's outlook have remarkably equal impacts of 30.9% each. They are followed by the sub-criteria of the descriptions of the status of key stakeholder relationships and how the organization is responding to the legitimate needs and wishes of key stakeholders with %24.1 and descriptions of qualitative indicators in terms of objectives and risks and opportunities, their significance, impact, and the methods and assumptions used in their creation with 14.2%. The "Performance" sub-criteria weights assessment meets the AHP consistency requirement with a CR of 6%.

Next, the table provides the priority weights of the consensus pair-wise comparison for the "Outlook" sub-criteria. Accordingly, as a result of the analysis of the pair-wise comparison values of the sub-criteria affecting the general appearance main criterion, it is remarkable that the sub-criteria of the organization's expectations about the situations likely to be encountered in its external environment in the short, medium and long term has an effect with 25%, while the sub-criteria of the statements about how it will affect the organization has an effect of 50%. Another sub-criterion, How the organization is organized to respond to the critical challenges and uncertainties currently facing it, has an impact of 25%. The "Outlook" sub-criteria weights assessment meets the AHP consistency requirement with a CR of 0%.H

Finally, the priority listing of the consensus pair-wise comparison for the "Basis of Preparation and Presentation" sub-criteria is also presented in the table. Accordingly, as a result of the pair-wise comparison values of the sub-criteria affecting the main criterion of the basis of preparation and presentation, the criterion of the disclosures regarding the organization's materiality determination process is the most important sub-criteria affecting the main criterion of preparation and presentation basis with 29.8%. Then, the sub-criteria of how the organization is organized to respond to the critical challenges and uncertainties currently facing it and a summary of the major frameworks and methods used to qualify or evaluate material issues equally impact the criteria at 24.6%. Finally, the sub-criterion of an explanation of the reporting limit and how it is determined is in last place with 21.0%.

All sub-criteria were combined after calculating the pair-wise comparison and priority values (weights) of the main criteria and the pair-wise comparison and priority values (weights) of the sub-criteria constituting the main criterion within the relevant main criterion.

In other words, by calculating the importance weights of each criterion in the lowest step of the hierarchy regarding the decision problem, the solution phase of the model was started, and the IRI was created.

Figure 2 shows the view of the IRI, where thirty-nine indicators are ranked according to their priority values.

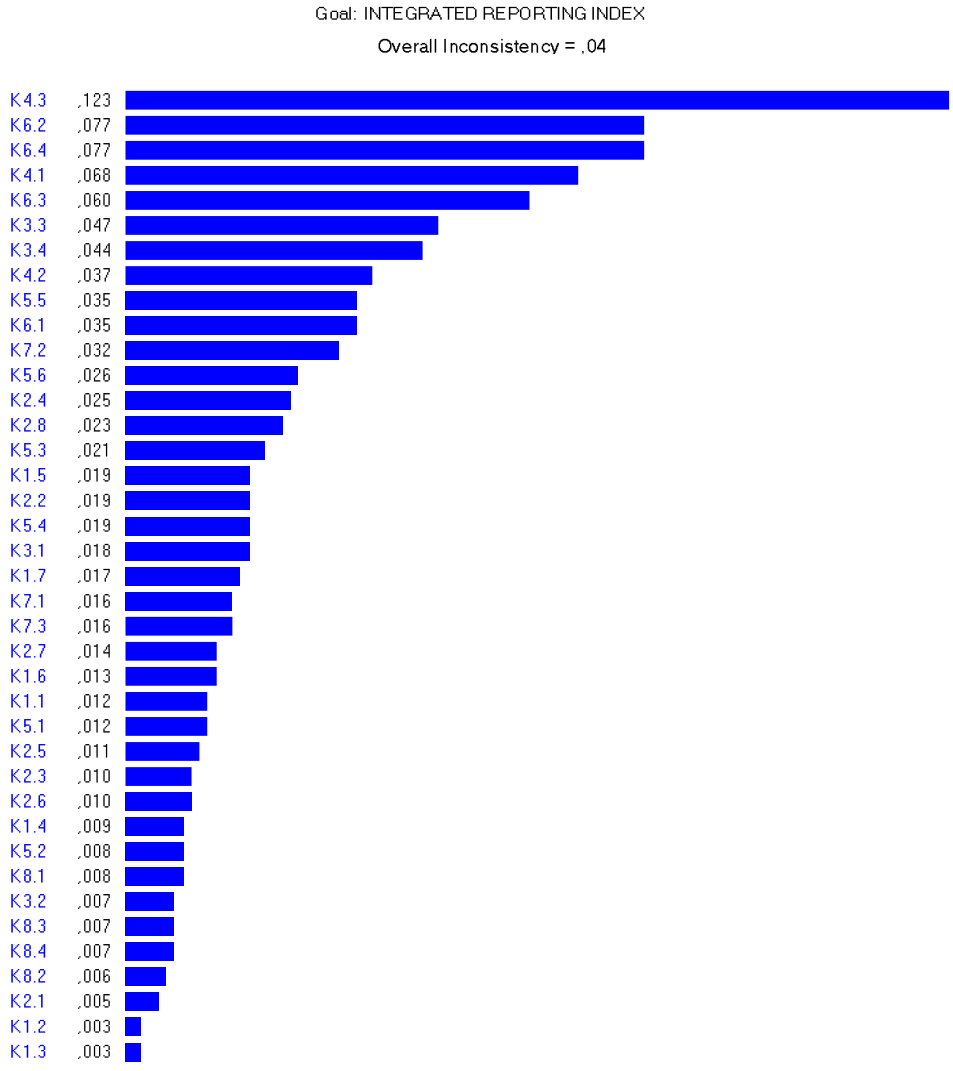


**Figure 2.** Integrated reporting index

Accordingly, it is seen that the most important indicator forming the IRI comes from the Risk and Opportunities (K4) category. The sub-criteria of the actions taken to mitigate or manage key risks or create value from key opportunities, including setting associated strategic objectives, strategies, policies, objectives, and KPIs (K4.3) out of thirty-nine indicators, with 12.3%, is the most important indicator that makes up the IRI.

Next, among the Performance key criteria, disclosures about the effects (positive and negative) on the capital of the organization, including the effects on the capital upstream and down the value chain (K6.2) and disclosures about the links between past and current performance, and between current performance and the organization's outlook (K6.4) are indicators that equally affect IRI with a rate of 7.7% each.

The following indicators including the criteria of the actions taken to mitigate or manage key risks or create value from key opportunities, including setting associated strategic objectives, strategies, policies, objectives, and KPIs (K4.3) affect the IRI with 12.3%, disclosures about the effects (positive and negative) on the capitals of the organization, including the effects on the capitals upstream and down the value chain (K6.2) with 7.7%, disclosures about the links between past and current performance, and between current performance and the organization's outlook (K6.4) with 7.7%, the organization identifies specific sources of risks and opportunities (internal, external, or commonly a mix of the two) and describes these sources, including their

impact on capitals and their availability, quality, and affordability (K4.1) with %6.8, descriptions of the status of key stakeholder relationships and how the organization is responding to the legitimate needs and wishes of key stakeholders (K6.3) with 6%, clarification on key stakeholders and other dependencies (e.g., raw materials) and key factors affecting the external environment (K3.3) with 4.7%, links to information covered under other content elements such as strategy, risk and opportunities, and performance (financial issues such as cost reduction and revenues, etc.) (K3.4) with 4.4%, the organization's assessment of the likelihood of the risk or opportunity occurring and the magnitude of the impact if it does, taking into account the specific circumstances that led to the risk or opportunity being realized (there will always be some degree of uncertainty in such disclosure) (K4.2) with 3.7%, differentiation factors that enable the organization to have a competitive advantage and create value (the role of innovation is how the organization develops and uses its intellectual capitals, the extent to which environmental and social considerations are incorporated into the organization's strategy to gain a competitive advantage) (K5.5) with 3.5%, descriptions of qualitative indicators in terms of objectives and risks and opportunities, their significance, impact, and the methods and assumptions used in their creation (K6.1) with 3.5%, statements about how this (namely the organization's expectations about the situations likely to be encountered in its external environment in the short, medium and long term) will affect the organization (K7.2) with 3.2%, how wages and incentives are linked to value creation in the short, medium, and long term and how they affect the organization's use and impact of its capitals (K2.8) with 2.7%, key features and findings of stakeholder interaction used in formulating strategy and resource allocation plans (K5.6) with 2.6%, how the organization's culture, ethical principles, and values are reflected in its use and influencing of capitals, including relationships with key stakeholders (K2.4) with 2.1%, how to measure achievements and targeted results in the short, medium, and long term (K5.3) with 2.1%, specific processes used to create and monitor the organization's culture, including making strategic decisions and the organization's approaches to the mechanisms it uses to address risk, integrity, and ethical issues (K2.2) with 2%, the organization's position in the value chain (K1.5) with 1.9%, the link between the organization's strategy and resource allocation plans and the information covered by other content items (Risks and Opportunities) (K5.4) with 1.9%, a clear explanation of the key elements of the business model (K3.1) with 1.8%, important factors influencing the organization's external environment and the organization's response (K1.7) with 1.7%, organization's expectations about the situations likely to be encountered in its external environment in the short, medium and long term (K7,1) with 1.6%, how the organization is organized to respond to the critical challenges and uncertainties currently facing it (K7.3) with 1.6%, responsibility of corporate governance officers to encourage and implement innovation (K2.7) with 1.4%, important quantitative information highlighting the major changes experienced by the organization compared to previous periods (K1.6) with 1.3%, organization's culture, ethical principles, and values (K1.1) with 1.2%, ownership and operating structure of the organization (K1.2) with 1.2%, important factors influencing the organization's external environment and the organization's response (K2.5) with 1.1%, measures taken by corporate governance officers to determine and monitor the strategic direction of the organization and its approach to risk management (K2.3) with 1.0%, whether the organization carries out corporate governance practices that exceed legal requirements (K2.6) with 1.0%, competitive structure and market position of the organization (K1.4) with 0.9%, resource transfer plans needed to implement its strategy (K5.2) with 0.8%, disclosures regarding the organization's materiality determination process (K8.1) with 0.8%, a logical flow of message appropriate to the context of the organization (K3.2) with 0.7%, how the organization is organized to respond to the critical challenges and uncertainties currently facing it (K8.3) with 0.7%, a summary of the major frameworks and methods used to qualify or evaluate material issues (K8.4) with 0.7%, an explanation of the reporting limit and how it is determined (K8.2) with 0.6%, skills and different aspects of corporate governance officers (K2.1) with 0.5%, ownership and operating structure of the organization (K1.2) with 0.3%, and organization's core activities and markets (K1.3) with 0.3%.

## 5. CONCLUSION

Representing the future of CR as the cutting edge of CR worldwide, IR stands as a leading communication channel that ensures that the value created by the organizations and all the factors associated with this value is communicated clearly and concisely to the stakeholders. In this context, at the same time, It helps build trust and encourages key stakeholders to continue partnering with the organization to continue creating value in the future, effectively sharing the benefits of creating value together with the value created.

In this study, an IRI has been developed that allows all stakeholders, especially investors, to measure the value created by both social and economic organizations and the potential of the value they aim to create in the future, and allows the changes in the value they create over time to be monitored. The AHP Model, one of the MCDM techniques, was used in the creation of the IRI.

As a result of the analysis findings, the sub-criteria of the actions taken to mitigate or manage key risks or create value from critical opportunities, including setting associated strategic objectives, strategies, policies, objectives, and KPIs, were found to be the most crucial indicator forming the IRI with 12.3% out of 39 (thirty-nine) indicators. Then, disclosures about the effects (positive and negative) on the capital of the organization, including the effects on the capital upstream and down the value chain, and disclosures about the links between past and current performance, and between current performance and the organization's outlook are the second and third indicators that equally affect IRI with a rate of 7.7% each, followed by less frequent 36 (thirty-six) indicators.

When the index data is examined in general, it is seen that the indicator items that make up 40.5% of the index are related to the risk conditions and future opportunities of organizations/companies and their explanations regarding performance analysis. Looking at the subsequent ranking, the indicator item that most heavily affects the IRI index is the business models of companies, which is closely related to the users' ability to make a full assessment of the performance of the companies. The disclosure indicator about other dependencies and essential factors affecting the main stakeholders and the external environment, such as raw materials, has an impact on IRI by 4.7%. Considering all these analysis findings, it is concluded that investors are looking for an information set that can clearly and concisely link risk and expected performance and, at the same time, present it clearly and accurately in the decision-making process.

Considering that, as we explained in the paragraphs above, value creation is a holistic and complex phenomenon that includes the processes of ensuring the sustainability of the created value, harmonizing innovative inventions that allow the value to be transformed when necessary, and ensuring the transmission of value while preserving its efficiency and effectiveness, the necessity of analyzing the created value with an interdisciplinary approach becomes evident. Thanks to IR, which enables this in the context of CR, the flow of qualified information about financial and non-financial assets of organizations also makes it possible to distribute and use global capital efficiently and rationally. In the same context, IRI enables the improvement and comparison of IRs prepared by considering their unique structural and operational characteristics. IRI has been developed for the use of organizations/companies that prepare integrated reports, organizations/companies that do not prepare integrated reports but have the potential to prepare them in the future, and all stakeholders. As a matter of fact, in the most general terms, determining, measuring, and collecting data for companies preparing integrated reports, changing the internal processes related to information activities, and the successful implementation of reporting systems are defined as the main difficulties. Therefore, being qualified with an IRI stands out in terms of producing an integrated report for companies and improving their internal decision-making processes.

In addition to the above-mentioned aspects of IRI, the development of appropriate information systems is essential for companies moving towards IR, given that IR practitioners in the Republic of South Africa, the country that first embarked on their IR journey today, have come a long way in developing appropriate information systems to support their reporting content, and it should be considered as the primary focus area. Besides, it is vital to investigate the reasons for companies to start an innovative IR initiative and to encourage companies to prepare IRs. At this point, although the antecedent factors such as ease of fundraising, gaining reputation, seeking/advantage of competition, and sharing information on social and environmental issues encourage companies to be subject to an index in the context of IR voluntarily, being qualified in such an index, in the long run, is related to the company's IVC. It is predicted that it will be a part of a natural process that it goes through in order to blend all the formations and position it in its business models and strategies. This study explores and prioritizes only the IRI criteria. Given the prediction that companies will function in an IRI in the

coming period, future research should investigate the IVC performance of indexed companies relative to other companies and the challenges and reservations of non-indexed companies.

Therefore, other research topics to be made in the upcoming period could be investigated in more detail in terms of the IVC performance of the companies subject to the index compared to other companies, the risk conditions the companies are in, and how they handle the opportunities they carry in the future. The way performance and value are evaluated today are often unrelated (Lakshan *et al.*, 2021). The contribution to stakeholders and society, which consists of broader value factors, and the performance effects of financial analyzes abstracted from these effects are not disaggregated [Güldoğan, 2022]. In this sense, taking and synthesizing the traditional accounting perspective, investor perspective, and social perspective as a whole is the most significant element of understanding, monitoring, and communicating the value creation process. Therefore, in future studies that reveal the reservations and difficulties of companies that are not subject to the index, the findings related to performance analyses should be discussed within this framework.

**Ethics Committee Declaration**
Ethics committee declaration is not required for the study.

**Author Contribution Rate Declaration**
The data were collected by Özben GÜLDOĞAN. The analysis was carried out by Özben GÜLDOĞAN & Hayrettin USUL.

**Conflict Statement**
There is no conflict of interest between the authors.

**Declaration of Support**
No support was received from any organization for this study.
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