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An Exploratory Analysis of Sustainability Indicators in Turkish Small- and Medium-Sized Industrial Enterprises

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Abstract: Significant differences exist between the sustainability practices of large businesses and those of small- and medium-sized enterprises in the industrial sector. Small- and medium-sized enterprises have restricted access to capital, resources, and experience. Most sustainable manufacturing strategies are based on indicators and evaluation models developed for large firms. This study aims to identify sustainability indicators for small- and medium-sized industrial firms. The sustainability indicators are generated from the G4-specific standard disclosures of the Global Reporting Initiative, which provide a triple-bottom-line approach. A total of 142 senior and middle sustainability-focused managers and partners participated in the survey. An exploratory factor analysis was performed in the first step, and 12 key factors were found. The Best–Worst Method (BWM) was employed in the second step to rank the criteria in order of priority. As a theoretical contribution, this study introduces human rights and economic impact on society as two additional sustainability indicators for small- and medium-sized enterprises. The two most significant aspects of sustainability for Turkish small- and medium-sized businesses are labor rights and energy saving. This study provides empirical evidence from a broad range of stakeholders for the conceptually addressed challenges of sustainability in prior studies. The results demonstrate empirically that the sustainability-based value creation for stakeholder interests, such as employees at the core of business activities, is greater in small and medium enterprises than for other stakeholders. This study’s findings will give managers a framework for establishing key sustainability indicators for allocating the limited resources of small- and medium-sized enterprises.



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1. Introduction

In the economic structure of countries, small- and medium-sized enterprises (SMEs) have long occupied a prominent position. However, in the literature, SME, a widespread concept, has traditionally been seen as an open-ended phenomenon. Product and production have long been intertwined with SMEs and have continued to advance. In today’s world, where technological and financial changes are progressing rapidly, this represents an essential potential for SME revitalization. The crucial aspect is that current research outcomes will be consistent with future ideals, resulting in the fact that the resources taken from the future and exploited today will pose a significant difficulty for future generations. Therefore, sustainability is one of the essential principles for small- and medium-sized businesses that wish to leave a better process to future generations because sustainability includes not only economic success but also social and environmental development for SMEs. Regarding sustainability, processing environmental issues alone by considering them today and employing them in production does not yield a long-term return. Therefore, SMEs should always be included in studies based on sustainability in the production and output phases.

A country's economic and social development relies heavily on its manufacturing sector's success [1] (Galal & Moneim, 2015). Nevertheless, they are cited as a significant source of environmental and societal problems [2] (Zeng et al., 2011). Triple bottom line (TBL) provides a comprehensive approach for measuring sustainability performance in manufacturing industries considering the three dimensions: economic, environmental, and social [3] (Ahmad & Wong, 2019). However, SMEs are less likely to deal with sustainability concerns than big corporations, although they contribute significantly to economic growth through innovation, output volume, and job creation [4] (Mitchell et al., 2020). This is primarily because the most extensively used sustainability tools were developed for large corporations. SMEs, on the other hand, face unique adoption problems. One of the key challenges is that SMEs have limited time and financial resources to implement sustainability initiatives [5] (Alshawi et al., 2011). Another challenge is that SMEs frequently need more expertise and resources to enhance their competency, inhibiting their capacity to prioritize essential elements and evaluate time and resources. These characteristics make it difficult for SMEs to adopt effective business processes. Moreover, current sustainability instruments are inadequate for SMEs due to their complexity, limited flexibility, and formal procedures [6] (Arena & Azzone, 2012). This paper proposes a process for producing a set of essential sustainability indicators compliant with worldwide sustainability reporting frameworks but targeted to SMEs.

In order to successfully assess and monitor the industrial sustainability performance, there is still a need for good indicators [7] (Singh et al., 2014) to be customized to varied settings within the manufacturing industry, particularly in the context of SMEs [8] (Winroth et al., 2016). Sustainability performance measurement in industrial SMEs has been hampered by a need for more usable and applicable indicators [9] (Ocampo et al., 2016). As a result, it is critical to adequately assess sustainability performance in manufacturing industries by tailoring relevant indicators to the sector context [10] (Mengistu & Panizzolo, 2022). The primary objective of this research is to provide a limited number of core sustainability indicators applicable to industrial SMEs. The literature analysis shows that the previous studies primarily focused on large manufacturing industries rather than SMEs. A limited number of studies have attempted to reveal the indicators of corporate sustainability (CS) in SMEs [10]. These studies commonly used expert decision-making models with a limited number of participants [6,7,11] (Hsu et al., 2017). The second objective is to develop a framework for CS in industrial SMEs with a diverse set of stakeholders using both a survey and an expert decision-making model. There is a rising tendency for research to consider only two sustainable dimensions simultaneously, and only a few studies cover all three dimensions simultaneously, utilizing the triple account of results [12,13] (Alvarez et al., 2017; Khan et al., 2021). The third objective is to provide a TBL-based corporate sustainability framework. Previous studies looked at the profitability-related financial characteristics of SMEs as economic sustainability indicators [3,8]. This is an initial study that includes the company's economic value generation with society as an economic indicator. The study introduces human rights as a critical factor and aims to contribute to stakeholder theory. Decision makers can use the findings of this study to improve or enhance their existing sustainable manufacturing strategies. This study tailors a globally recognized sustainability metric suited to the needs of industrial SMEs by selecting the essential indicators and ranking them according to their importance.

The section that follows is a literature review. Global Reporting Initiative (GRI) G4-specific legal disclosures were utilized to investigate the underlying pattern of dimensions and components of the CS framework for industrial SMEs. The theoretical background is given in the fourth section. Sustainability evaluation methods in manufacturing involve a human-reasoning-based input [7]. This study seeks to develop a framework for SME sustainability metrics. Exploratory factor analysis is frequently employed for dimension reduction objectives. For this purpose, the fifth section applies exploratory factor analysis (EFA) and the Best–Worst Method (BWM). Using the GRI disclosure, an illustrated set of indicators for industrial SMEs is identified and used as input variables in EFA. The

indicators found by EFA are used as inputs in the BWM ranked in order of importance by industry experts. The results are presented in the sixth section, followed by a discussion. The final remarks and implications are included in the conclusion.

2. Literature Review

In this study, a small- or medium-sized firm is defined as an entity with less than 250 employees, as defined by the European Commission [14] (CEC, 1996). With their limited resources, industrial SMEs frequently find themselves unable to afford the improvements required to meet environmental rules and product controls, according to the World Commission on Environment and Development [15] (WCED, 1987). Small-scale industries, such as metalworking, machine tools, printing, tanning, and dying, are among the worst violators of environmental legislation in their countries. Most sustainability management solutions are either proven to be inapplicable to industrial SMEs or are only used in a small number of cases [16] (Johnson & Schaltegger, 2016). As a result, challenges for industrial SMEs include a lack of awareness about sustainability issues [17] (Lawrence et al., 2006), a lack of perceived benefits [18] (Brammer et al., 2012), a lack of knowledge and competence [19] (Seidel et al., 2008), and a lack of human and financial resources [20] (Borga et al., 2009). While some evidence suggests that a higher number of owner-managers are actively involved in recycling, energy efficiency, responsible purchasing and selling, and initiatives to minimize carbon emissions [21] (Revell et al., 2010), SMEs have much fewer ISO 14001 registrations than large enterprises [22] (Cassells et al., 2011).

Multiple parties collaborated on the Global Reporting Initiative's (GRI) sustainability reporting guidelines to produce generally recognized reporting criteria for an organization's triple-bottom-line activities [23,24] (Elkington, 1997; Buhr et al., 2014). The guidelines organize the specific standard disclosures into three areas: economic, environmental, and social. The economic aspect of sustainability refers to the organization's effects on the economic situations of its stakeholders and local, national, and international economic systems. Therefore, it needs to emphasize the organization's financial health. Labor practices and decent work, human rights, community, and product responsibility are the four sub-categories of the social category. Appendix A presents the GRI Elements and the number of indicators summarized in each category for a total of 91 indicators.

According to a survey conducted in 49 countries and 4900 businesses, GRI is the most widely used framework [25] (KPMG, 2017). Consequently, most companies do not identify climate change as a financial danger, but a few businesses acknowledge the issue of human rights. Various researchers have investigated the GRI sustainability indicators disclosed by different industries [26] (Lozano, 2013) across countries including Canada [27] (Roca et al., 2012), Netherlands [28] (Asif et al., 2013), Spain [29] (Gallego, 2006, and Greece [30] (Skouloudis and Evangelinos, 2009). They found several trends in the results. Overall, economic indicators about financial concerns, environmental indicators relating to energy and water, and social indicators referring to labor practices were widely reported [27]. Additionally, the reported indicators and their frequency varied between industries. This is one of Turkey's first studies to analyze the GRI indicators utilized by industrial SMEs.

A detailed study by the Istanbul Chamber of Industry analyzed the sustainability efforts of 100 significant industrial businesses. After these companies, which operate in six public and 94 private sectors, responded to the sustainability questions, an advanced sustainability analysis was generated. According to the findings, 21 of these organizations have sustainability reports. Therefore, the number of organizations with corporate responsibility and environmental reporting is estimated to be four. As a result of the investigation, the number of organizations having explanations regarding sustainability is estimated to be 15. Thirty-one institutions have operated in environmental and social responsibility fields and have issued a statement. Therefore, four companies need sustainability reports or explanations [31] (Yangil, 2015).

The studies undertaken in Turkey examine the disclosures in the sustainability reports of primarily Borsa Istanbul-listed major corporations [32,33] (Gencoglu ve Aytac, 2016;

Ertan, 2018). According to the study by Saygili et al. (2020) [34], the most prominent concerns in the sustainability reports of publicly traded firms are economic performance, environmental sustainability products and services, social sustainability employees, and health and safety issues. In addition, the results of the regression analysis revealed that as the age and number of employees of a business increase, so does the extent of its sustainability reports. Caliskan et al., 2022 [35] evaluated the sustainability reports of small- and medium-sized businesses and major corporations. It has been discovered that disclosures vary according to the size of the firms. Furthermore, it has been observed that significant organizations provide more explanations in their sustainability reports than small- and medium-sized enterprises.

3. Theoretical Background

Previous research carried out to identify sustainability indicators is discussed in this section. Table 1 provides a brief overview of the proposed frameworks. Except for one [3], all the studies selected were carried out in industrial SMEs. Arena and Azzone, 2012 [6] proposed a comprehensive approach for determining a standard set of fundamental sustainability criteria, emphasizing SMEs. The research moved on from surveying existing international frameworks for sustainability reporting to examining the primary reasons why such standards are so inapplicable to SMEs. The study then presented a theoretical framework for establishing a collection of essential sustainability indicators that originated from GRI but took into account the particular characteristics of SMEs. The proposed framework excluded economic indicators. Finally, the authors described and discussed the proposed methodology's implementation within a cluster of Italian steel SMEs.

Singh et al., 2014 [7] used a fuzzy-inference-system-based model to assess the sustainability of industrial SMEs in Taiwan. To examine industrial SMEs, linguistic elements are utilized to determine decision makers' attitudes on the importance of sustainability measures and indicators, as well as organizational performance concerning indicators. The study developed a representative set of industrial SME sustainability indicators by considering SME characteristics. Winroth et al., 2016 [8] developed a set of sustainability performance criteria for manufacturing executives. The study presented a two-stage analysis, with the first stage consisting of a literature review to generate a preliminary list of sustainability indicators. The study's second phase administered a questionnaire to determine whether this list was applicable to production managers at Swedish SMEs. According to the study, 27 of the 52 proposed indicators were statistically significant, while the remaining 20 were supported by at least 50% of respondents. Economic indicators were regarded as the most favorable by respondents. However, additional economic indicators were required before they could be implemented.

Hsu et al., 2017 [11] used a quality function deployment (QFD) approach as their basic structure. They combined the fuzzy Delphi method (FDM), a modified fuzzy extent analytic hierarchy process (FEAHP), and the TOPSIS method to select, launch, and rank performance factors for enhancing the sustainability of manufacturing SMEs. A manager can utilize this integrated model to determine the metrics most important for the company's success and allocate resources accordingly.

Ahmad and Wong, 2019 [3] created and weighted sustainability indicators for the Malaysian food manufacturing sector. With the cooperation of academic, scientific, and business experts, the Delphi method was used to achieve the research objectives. The weights of the indicators were computed based on the assessments provided by the experts. In addition, an effort was made to obtain the consensus of experts regarding the inclusion of indicators. In addition to other pertinent findings, it was concluded that the social part of sustainability is more significant for the Malaysian food manufacturing company than the environmental or economic aspects.

Table 1. Selected sustainability indicators by previous studies.

Author(s)	Economic Indicators	Environmental Indicators	Social Indicators
Arena and Azzone, 2012 [6]		Materials, energy, water, greenhouse gas emissions, NO _x , SO _x , other significant air emissions, water discharge, waste, compliance, transport	Employment, occupational health and safety, training and education, diversity and equal opportunity, procurement practices, community, customer health and safety, compliance
Singh et al., 2014 [7]	Cost, quality, responsiveness, flexibility	Materials, reused and recyclable materials, hazardous and waste materials, non-renewable materials, renewable energy, energy intensity, water consumption, wastewater, land usage, direct and indirect emissions	Employee turnover, labor intensity, employee training, customers satisfaction, community involvement
Winroth et al., 2016 [8]	Employees, customers, development expenditure, production operation, supplier	Natural resources, energy, material, waste, and emissions, environmental legal and standard compliance	Health and safety, education and training, labor-management relations, diversity and equal opportunity, human capital
Hsu et al., 2017 [11]	Cost reduction, quality improvement, delivery performance, economic potential	Substance emissions, resource consumption, green manufacturing, environmental policy	Community impact, work environment, customer relationship
Ahmad and Wong, 2019 [3]	Revenue, profit, subsidy or tax relief from the government, the cost for raw materials, packaging, depreciation, labor, maintenance, environmental fines, utility, defective products, R&D, training, advertisement, and promotion	Materials used, energy used, water used, chemicals used, emissions, wastewater, solid waste	Labor rights, working conditions, labor well-being and satisfaction, customer well-being and satisfaction, community and social well-being, community and society satisfaction
Mengistu and Panizzolo, 2022 [10]	Profit, revenue, R&D expenditure, material and labor costs, maintenance and energy costs, packaging and inventory costs, product quality, lead time, on-time delivery	Water and recycled water use, energy and renewable energy use, energy efficiency and intensity, material and recycled material use, packaging, land use, GHG emissions, wastewater discharge, solid water disposal, recyclable waste	Employment opportunity, fair salary, employee turnover and satisfaction, occupational and customer health and safety, training and development, working conditions and hours, work-related injuries, lost working days, customer satisfaction and complaints, corruption

Mengistu and Panizzolo, 2022 [10] thoroughly reviewed the literature to identify appropriate sustainability indicators. A questionnaire based on the identified variables was developed prior to collecting data from Italian footwear SMEs. It was then pretested with the selected industrial professionals, academics, and researchers to refine the metrics further. Finally, the fuzzy Delphi technique with consistency aggregation was used to examine and select the final indicators. According to the study's findings, the indicators chosen focused on achieving industrial sustainability goals, such as increasing financial benefits, cutting costs, promoting market competitiveness, improving resource utilization effectiveness, and facilitating the well-being of workers, customers, and the community. As a result, Italian footwear SMEs may contribute to achieving sustainable development goals by fostering health and well-being, sustainable economic growth, providing productive jobs and decent work, and ensuring responsible consumption and production (SDGs).

4. Research Methodology

4.1. Measures and Data Collection

This study analyzes the perspectives of industrial SMEs in the province of Izmir on sustainability and the responses to their applications. To assess the underlying pattern of dimensions and items of the CS framework based on TBL, the Global Reporting Initiative (GRI) G4-specific standard disclosures were used. G4 included a total of 91 indicators for three sub-frameworks of economic, environmental, and social sustainability. The first stage of the analysis focus group survey was conducted among the executives of 7 industrial SMEs issuing sustainability reports. The focus group evaluation identified 49 sustainability indicators suitable for industrial firms. In the second analysis stage, respondents from micro, small, and medium enterprises in the industrial zone were identified to participate in the survey. Non-probability (purposive) sampling was used since there is a small group of people who have knowledge relevant to this research, [36] (Etikan & Bala 2017). Data were obtained via email or in-person interviews. Respondents included senior and mid-level managers and managing partners in charge of corporate sustainability initiatives. Among 290 target companies, 142 usable questionnaires were returned, generating a final response rate of 49%. Appendix B demonstrates preliminary sustainability indicators for SMEs.

4.2. Descriptive Statistics

Concurrently, exploratory factor analysis and BWM were used to identify the significant factors of sustainability practices in SMEs. As a result, employees from various positions in industrial SMEs in the province of Izmir took part in the study. Descriptive results related to the participation of respondents are presented in Table 2. While males made up 57.7% of the 142 survey participants, females made up 42.3% of the population. Males outnumber females. Most (71%) of the SME employees hold a bachelor's degree.

Table 2. Descriptive statistics.

Gender %		Education of Participants %		Position of Participants %	
Male	57.7	High school	11.3	Owner-manager	38.3
Female	42.3	University	71.1	Senior manager	31.6
		Graduate school	17.6	Mid-level manager	24.6
				Other	5.5
Age of Companies %		Sales Revenue of Companies %		No. of Employees in Companies %	
1–9 years	18.5	USD 0–4.9 million	31.5	1–9	44.0
10–19 years	44.4	USD 5–14.9 million	35.2	10–49	37.1
20 years and above	37.1	USD 15 million and above	33.3	50–249	38.9

4.3. Analyses

In the first stage, an exploratory factor analysis was used to determine the most important factors in online payment adoption. Using the results of the previous stage, best–worst analysis was performed in the second stage to determine the most important factors in sustainability practices of industrial SMEs.

4.3.1. Exploratory Factor Analysis

Factor analysis creates groups of strongly correlated variables or factors to reveal the relationships (correlations) between many variables. The variable groupings (also known as factors) are expected to represent the data's dimensions. Typically, a sample size of at least 100 observations is required, and a sample of fewer than 50 observations would not be sufficient for the researcher to study issues. There are sufficient correlations between the variables to proceed if Bartlett's test of sphericity is statistically significant (sig. 0.05). The overall test results and the measure of sampling adequacy (MSA) for each variable must be

4.3.2. Best–Worst Method

There are numerous decision-making approaches for various decisions, and the best appropriate model is constructed for each method's particular characteristics [39] (Ozturkoglu & Esendemir, 2014). The Best–Worst Method (BWM) model was selected to solve the specific research issue posed by this study. The Best–Worst Method (BWM) proposed by Rezaei, 2015 [40] is the newest of the multi-criteria decision-making (MCDM) techniques. Unlike other MCDM methods, this method concentrates on selecting the best and worst choices from available options. The most significant benefit of this strategy is that decision makers are no longer required to conduct pairwise comparisons of all defined criteria. The underlying concept of the strategy is first to identify the most and least acceptable choices. Then, pairwise comparisons are made between the best and worst choices and the remaining options. Finally, the consistency ratio is calculated within the reliability of the BWM methodology. In the subsequent years, the method was refined, and a minimum and maximum mathematical programming model was built to determine the appropriate weights for multiple factors [41] (Safarzadeh et al., 2018). This new method based on pairwise comparison has applicability in numerous fields and disciplines. The approach consists of six distinct steps, which are performed in the following order:

S1: Several decision factors have been developed.

One or more decision-makers determine the n problem criteria.

$$C = \{c_1, c_2, \dots, c_n\}$$

S2: The same decision makers select the best (C_B : most desired) and worst (C_W : least relevant) factors from a set of factors.

S3: The preference ratio of the best (C_B) factor selected based on the other factors is calculated for binary comparison.

The preference rate is set by the decision maker. This ratio ranges from one to nine (where one is equally significant and nine is extremely significant). Then, the best-to-others vector (A_B) is reached, which runs from best to others. This vector looks like this:

$$A_B = (a_{B1}, a_{B2}, \dots, a_{Bn})$$

Each a_{Bj} in the A_B vector represents the preference for factor B , which is the optimal factor, based on factor j . Value is an integer number between one and nine. Additionally, $a_{BB} = 1$. This indicates that the most important and desired factor will be compared.

S4: For binary comparison, the preference ratio of the worst (C_W) factor, selected based on all other factors, is computed.

For the worst factor, the preceding method is repeated. As a result, the vector with the lowest score among other factors is selected. Then a vector is named as 'others-to-worst' (A_W). The following is the vector.

$$A_W = (a_{1W}, a_{2W}, \dots, a_{nW})^T$$

Each a_{jW} in the A_W vector indicated that factor j over the worst factor W . Furthermore, $a_{WW} = 1$. This implies that the worst factor will be evaluated against itself.

S5: Each factor's optimal weight is calculated $w^* = (w_1^*, w_2^*, \dots, w_n^*)$.

The optimal weights for each factor are; $w_B/WJ = a_{Bj}$ and $w_j/WW = a_{jw}$ ($j = 1, 2, \dots, n$). To provide these conditions for the entire of j , it is important to find a solution where the highest absolute differences exist.

$|w_B/WJ - a_{Bj}|$ and $|w_j/WW - a_{jw}|$ must become minimized.

Moreover, the weight vector cannot be negative, and the overall condition must equal to 1. Consequently, the following issue arises.

$$\min \max \{|w_B/w_j - a_{Bj}|, |w_j/w_W - a_{jw}|\}$$

$$\sum w_j = 1, w_j \geq 0, \text{ for entire } j = 1, 2, \dots, n$$

The equation of the problem is moved to the next linear programming problem.

$$\min \xi, |w_B/w_j - a_{Bj}| \leq \xi, \text{ for entire } j$$

$$|w_j/WW - a_{jw}| \leq \xi, \text{ for the entire } j$$

$$\sum w_j = 1, w_j \geq 0, \text{ for entire } j = 1, 2, \dots, n$$

S6: With the completion and solution of this entire model, the optimum weights ($w_1^*, w_2^*, \dots, w_n^*$) and ξ value are determined.

The value of ξ expresses the maximum absolute difference and the analyzed consistency ratio (CR). The CR is used to control the reliability of the optimal weights, it expresses the reliability among the obtained weights, and the DM ensures the binary comparison data. For example, CR is shown as follows

$$CR = \xi^* / CI$$

The value of CR lies between 0 and 1 ($CR \in [0,1]$). Zero denotes total consistency. ξ represents the highest absolute difference discovered using Equation 4. The maximum ξ value is revealed by the *new* criterion, which identifies the CB criterion's most significant a_{BW} preference ratio (1,2, . . . ,9). As CI, these maximum values are employed. The greater the value, the weaker their consistency ratio and the less reliable the comparisons are.

The BWM assesses these factors' relative weights and significance in the second stage. Experts undertake two rounds of e-questionnaires in order to implement BWM. In the first phase, the experts are tasked with defining the best and worst dimensions and the criteria for each dimension. In the second round, expert opinions determined the preference for the best factor over all others and for all factors over the worst one. The responses are then used as input for the best-to-worst method, and the weights are computed.

Respondents to the survey were selected using a form of judgmental sampling. Thus, experts from the institutions listed in Table 4 of the ecosystem for the sustainability of industrial SMEs assisted via email in defining the weights of eight factors. This study assembles an expert panel by selecting subject-matter specialists who can contribute to the research with their knowledge. The specialists have a minimum of ten years of experience in their field.

Table 4. Demographic information of experts.

Expert	Working Experience	Sector	Position
1	14 years	SME development and organization of Turkey	SME expert
2	12 years	Sustainability consultancy company	Sustainability supervisor
3	10 years	Sustainability consultancy company	Sustainability advisor
4	10 years	SME	Sustainability expert
5	13 years	SME	Sustainability project manager
6	16 years	Academics	Associate professor
7	25 years	Academics	Professor

5. Results

5.1. Exploratory Factor Analysis

In the first round of factor analysis, 49 components were examined. The varimax method (orthogonal rotation) was used in the rotation process. Those with components below 0.50 were removed, and the analysis was repeated. In factor analysis, the suitability for each factor analysis can be examined with the Kaiser–Meyer–Olkin (KMO) coefficient and the Bartlett sphericity test. The KMO value is recommended to be greater than 60% for factorability. As seen in Table 5, the KMO value calculated as a result of the analysis is 78.2%, which is higher than the recommended value. Therefore, the data obtained are suitable for factor analysis. The Bartlett test examines whether there is a relationship between variables based on partial correlations. Bartlett's test results were 2829.103, and the significance was 0.000. Both results show that the sample size is suitable for factor analysis.

Table 5. KMO and Bartlett's test results.

Kaiser–Meyer–Olkin Measure of Sampling Adequacy			0.782
Bartlett's test of sphericity	Approx. chi-square		2829.103
	Df		820
	Sig.		0.000

Total variance analysis results are presented in Table 6. Although there are various criteria for determining the number of factors, a 12-factor model was created in the first-factor analysis. According to the explained variance percentage criteria, the cumulative total variance explained by these 12 factors is 72.438%. The variance percentages are above the 60% recommended rate in the social sciences.

Table 6. Total variance explained.

Factors	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.982	29.224	29.224	4.161	10.149	10.149
2	2.889	7.045	36.269	3.269	7.973	18.122
3	2.383	5.812	42.081	2.871	7.003	25.126
4	2.020	4.927	47.008	2.802	6.835	31.961
5	1.822	4.444	51.452	2.534	6.181	38.142
6	1.612	3.931	55.383	2.375	5.793	43.935
7	1.376	3.356	58.739	2.305	5.622	49.557
8	1.249	3.045	61.784	2.220	5.415	54.971
9	1.166	2.843	64.627	1.901	4.637	59.608
10	1.098	2.677	67.304	1.805	4.402	64.011
11	1.082	2.640	69.945	1.781	4.344	68.355
12	1.022	2.493	72.438	1.674	4.083	72.438

Each factor and item related to the factor, including Cronbach's alpha values, composite reliability (CR) and average variance extracted (AVE) are presented in Table 7.

Table 7. Sustainability indicators in industrial SMEs and related items.

Factors	Items	Item Description	Cronbach Alpha Value (α)	CR	AVE
1. Employee rights	ER1	Employee diversification	0.864	0.81	0.38
	ER2	Employee benefits			
	ER3	Rate of return to work after parental leave			
	ER4	Minimum notice periods			
	ER5	Occupational health and safety			
	ER6	Education and training programs			
	HR3	Prevention of employee discrimination			
2. Human rights	HR2	Human rights employee training	0.809	0.76	0.38
	HR4	Association and collective bargaining rights			
	HR5	Prevention of child labor			
	HR7	Human rights training of security personnel			
	HR10	Supplier human rights assessment			
3. Product responsibility	PR1	Product health and safety	0.803	0.74	0.37
	PR2	Product labelling			
	PR6	Sale of banned products			
	PR7	Compliance with marketing regulations			
	PR9	Compliance with regulations concerning the provision and use of products			

Table 7. Cont.

Factors	Items	Item Description	Cronbach Alpha Value (α)	CR	AVE
4. Recycling	RE1	Recycled material	0.793	0.78	0.54
	RE2	Recycled water and wastes			
	RE3	Recycled packaging			
5. Green products and suppliers	GR2	Compliance with environmental law	0.762	0.70	0.43
	GR3	Environmentally friendly transportation			
	GR5	Environmentally friendly suppliers			
6. Environmental protection	EP1	Conservation of biological diversity	0.717	0.72	0.57
	EP2	Reduction in greenhouse gas emissions			
7. Economic impact on labor and local community	EC3	Employee benefit plans	0.730	0.74	0.43
	EC5	Entry-level wages			
	EC6	Local employment			
	EC9	Local supplier			
8. Labor equality	EE1	Equal opportunities for employees	0.676	0.61	0.45
	EE2	Equal remuneration for women and men			
9. Social compliance	SC1	Anti-corruption	0.660	0.53	0.36
	SC2	Compliance with competition rules			
10. Energy-saving	ES1	Reduction in energy consumption	0.680	0.65	0.49
	ES2	Energy saving product			
11. Customer relations	CR1	Customer satisfaction surveys	0.653	0.56	0.39
	CR2	Importance given to customer privacy			
12. Economic issues	EC1	Direct economic impacts	0.720	0.74	0.50
	EC7	Financial implications of climate change			
	EC8	Infrastructure investments			

Methodological constraints: average variance extracted (AVE) 0.5 is the required parameter threshold value. If the composite reliability for the provided construct is more than 0.60, an AVE of 0.4 can be accepted [42] (Hair et al., 2017). Hence, factors with AVE values close to 0.40 are not excluded from the results. If the loading value of a manifest is greater than 0.5, it is considered significant for individual item reliability.

5.2. Best–Worst Method

Exploratory factor analysis determined 12 factors in the sustainability practices of industrial SMEs. To conduct BWM, similar factors were combined, and the following eight factors were determined: labor rights (Factors 1 and 8), human rights, environmental protection, economic issues (Factors 12 and 7), recycling, product responsibility and compliance (Factors 9 and 3), energy saving, and customer relations.

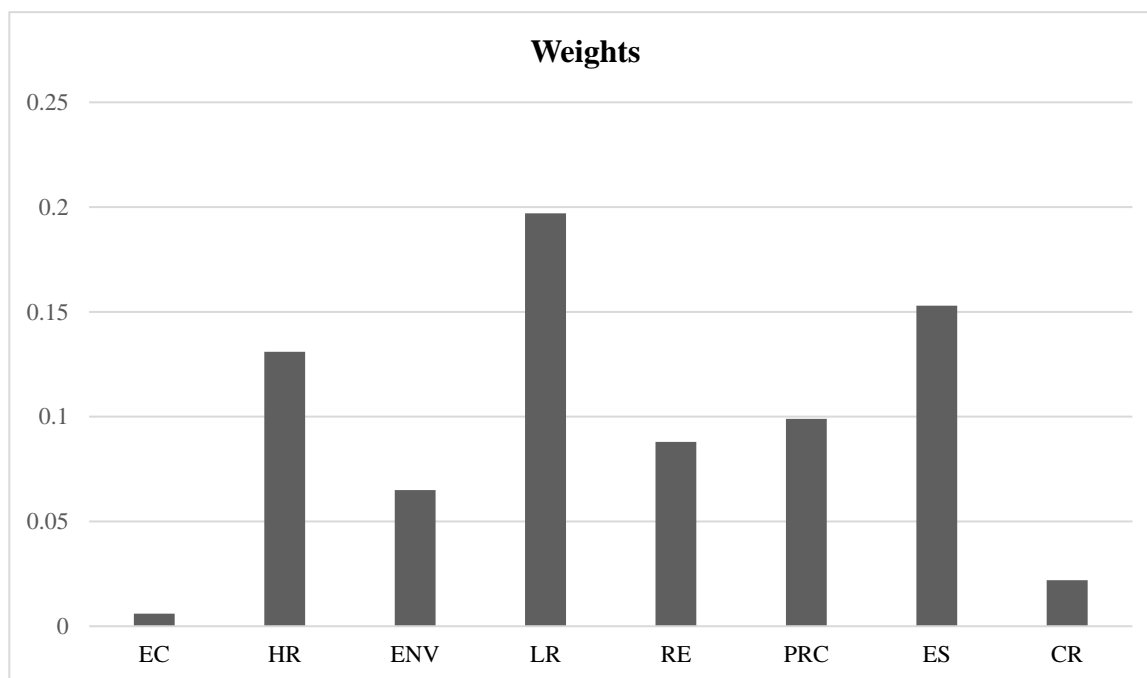
The suggested mathematical model is encoded in AMPL and solved using CPLEX 9.1 with a Pentium IV processor running at 2.8 GHz and 1 GB of RAM. Solving the BWM model can calculate the relative weights of the factors. Table 8 displays the factor weights.

According to BWM's findings, perceived usefulness has been rated as the most essential of the eight factors. The second and third most important factors are relative advantage and perceived ease of use, followed by perceived risk and perceived integrity presented in Figure 1. The results are consistent with the literature.

After obtaining the results, the mean and consistency values of the factors should be examined. According to the mean values, "recycling" has the highest mean value, while "environment"-associated sustainability efforts of industrial SMEs have the lowest mean value (Table 9).

Table 8. Weights of main criteria.

Criteria	Local Weights	Rank	Definitions
Economic impact and compliance (EC)	0.006	8	Economic impacts on labor and local community, climate change, and infrastructure investments
Human rights (HR)	0.131	3	Human rights training and assessment, prevention of child labor
Environment protection (ENV)	0.065	6	Green products, transportation and suppliers, biological diversity, and GHG emissions
Labor rights (LR)	0.197	1	Employee rights and labor equality
Recycling (RE)	0.088	5	Recycled material, water, wastes and packaging
Product responsibility and compliance (PRC)	0.099	4	Product responsibility and compliance with market rules and regulations
Energy saving (ES)	0.153	2	Reduction in energy consumption and energy saving product
Customer relations (CR)	0.022	7	Customer satisfaction and privacy

**Figure 1.** Graphical representation of the BWM results.**Table 9.** Consistency of each criterion.

	EC	HR	ENV	LR	RE	PRC	ES	CR
Mean	0.122	0.290	0.070	0.187	0.364	0.290	0.194	0.224
ϵ	0.068	0.020	0.028	0.038	0.043	0.043	0.090	0.080

The value of ϵ indicates the consistency of the comparison and values near zero exhibit a high degree of consistency [43] (Rezaei et al., 2018). Almost all values are quite close to zero, indicating that the comparisons are reliable, and the results are consistent. Consistency is greatest for “human rights”, while it is lowest for “energy saving”.

6. Discussion

The first factor of the analysis results is 'Employee rights' and its items of it. Employee diversification and benefits, rate of return to work after parental leave, minimum notice periods, occupational health and safety, education and training programs, and employee discrimination prevention are among the items. Employee benefit plans are making strides toward sustainability. High employee diversification and training programs in industrial SMEs to improve their sustainability. The high incidence of return to work following parental leave is a critical development milestone for industrial SMEs. A majority of the existing literature emphasizes employee rights as one of the significant sustainability indicators for industrial SMEs [6–8,10,44] (Esendemir Saygili et al., 2019).

The second factor is 'Human rights,' which includes employee human rights training, association and collective bargaining rights, child labor prevention, security personnel human rights training, and supplier human rights assessment. These concerns will help industrial businesses achieve social democracy. Industrial SMEs will be able to achieve higher levels of sustainability performance by avoiding child labor. Otherwise, company merit and industrial SME advertisements would fail. Human rights training for security personnel will also positively impact the sustainability practices of industrial SMEs. This is a distinguishing factor of the present research. Previous studies disregarded the human rights dimension that Turkish SMEs emphasized [6,10]. The explanations could be socio-economic. Some blue-collar workers in larger industrial businesses, particularly those in the petrochemical, textile, cement, and metal industries, have union rights [45] (Birelma, 2018). As a cultural phenomenon, families are financially responsible for their children until they marry. As a result, society and the government punish families that send their children to work instead of school. Children from low-income homes, on the other hand, work illegally.

The third factor, 'Product Responsibility,' incorporates health and safety, product labeling, the sale of banned products, compliance with marketing regulations, and compliance with regulations governing the provision and use of products. Previous research has revealed issues related to product responsibility such as customer health and safety, customer satisfaction and complaints [3,6,10]. Recycling is the fourth factor, comprising recycled material, recycled water and waste, and recycled packaging. While recycling is significant in and of itself, all recycling-related items are also crucial for industrial SMEs, for industrial SMEs to obtain better sustainability results, using recycled materials is critical [7,10,11]. Recycling water and waste is crucial for industrial SMEs, particularly regarding environmental sustainability and leaving a legacy for future generations. The fifth factor, 'Green products and suppliers,' includes environmentally friendly products, compliance with environmental law, environmentally friendly transportation, and environmentally friendly suppliers. High environmental product standards will assure outstanding performance in sustainability studies. The environmentally friendly transportation item has a favorable impact on the industrial SMEs' potential to achieve higher levels of sustainability. The large number of environmentally friendly suppliers of industrial SMEs will help to advance sustainability efforts [6]. The sixth aspect, 'Environmental Protection,' comprises preserving biological diversity and decreasing greenhouse gas emissions. Conservation of biological diversity and reduction in greenhouse gas (GHG) emissions will drive sustainability practices forward in environmental protection efforts. Giving more attention to the environment and a more conscientious society are essential for industrial SMEs in the long run. The environment was emphasized as a critical indicator in all earlier studies summarized in Table 1.

The seventh aspect is the "Economic Impact on Labor and Local Community," which covers employee benefit plans, entry-level pay, local employment, and local suppliers. Starting wages will have a favorable impact on the long-term viability of industrial SMEs. High levels of local community engagement and product labeling will have a favorable impact on sustainability standards. Local supplier item is a critical factor for industrial SMEs to succeed inside the country and among themselves. Domestic economic values

and financial indicators will achieve a successful and realistic stage in this approach. This is another distinguishing component of this study. GRI economic indicators represent a company's economic value generation concerning society.

In comparison, prior research investigated the profitability-related financial features of SMEs as indicators of economic sustainability [3,10]. The eighth factor is 'Labor Equality,' which involves an equal opportunity for employees and equal remuneration for men and women. Equal remuneration and opportunity for men and women will lead to higher sustainability standards [6,8]. Social compliance, the ninth factor, encompasses anti-corruption and compliance with competition standards [10]. Anti-corruption rules will assist industrial SMEs in reaching an economically and socially sustainable point of sustainability. As a result of globalization, compliance with legal responsibilities and processes is now more binding and mandatory. In addition, compliance with the competition regulations provides industrial SMEs with a more reliable position and excellent market value [6].

The tenth factor, 'Energy Saving,' encompasses energy savings and energy-saving products. In the initial research summarized in Table 1, energy was emphasized as a crucial indicator. Therefore, examining the energy-saving item is one of the topics that should be of utmost importance for SMEs. Because it has been shown that industrial SMEs with excellent energy-saving administration have achieved much better sustainability results, creating an energy-efficient product and introducing it to the relevant industry market will enable them to achieve economic sustainability. The eleventh factor is 'Customer Relations,' which includes customer satisfaction surveys and the importance placed on customer privacy [3,7,10,11]. The focus on customer privacy contributes significantly to the market credibility of industrial SMEs. Economic issues, which include direct economic impacts and infrastructure investments, are the twelfth factor. They will improve the performance of economic sustainability efforts. As indicated in the seventh factor, this dimension is not addressed in the earlier literature, and it is one of the distinguishing features of this study.

According to the results of the BWM, "labor rights" and "energy saving" were ranked as the first and second significant issues. These two characteristics are the only factors addressed by the preceding studies presented in Table 1. Labor and energy are the two key sustainability considerations for SMEs with limited resources. The third significant element, "human rights," is a distinguishing feature of this study. Prior research neglected the human rights factor emphasized by Turkish SMEs. The explanations may have a socioeconomic basis. Some blue-collar workers in more significant industrial enterprises, especially petrochemical, textile, cement, and metal industries, have union rights. In addition, families being financially responsible for their children till marriage is a cultural phenomenon.

Consequently, society and the government penalize families that send their children to work instead of school. In contrast, children from low-income households engage in unlawful work. The country's circumstances may have influenced expert opinions for the first three categories. In Turkey, labor rules are strict, and the consequences are deterrents. Financial penalties are highly costly for SMEs. For instance, the rules for child labor are likewise highly severe. Further, there are government incentives for energy efficiency and renewable energy initiatives for SMEs.

Prior studies frequently cite the fourth key component, "product responsibility and compliance," the fifth crucial aspect, "recycling," and the sixth significant factor, "customer relations." According to BWM's findings, "environmental protection" and "economic impact and compliance" are the least important criteria. In Turkey, environmental regulations could be more effective, fines are not deterrents, and violations of environmental rules need to be sufficiently monitored. The "economic impact and compliance" aspect is one of the defining characteristics of the study. Prior research examined the profitability-related financial aspects of SMEs as economic sustainability indicators, whereas GRI economic indicators highlight a company's economic value creation in society. This study investigates the economic impact of SMEs in society. According to the research, SMEs accord this issue the lowest priority.

7. Conclusions

Sustainability reinforces the significance of SMEs in obtaining a place on economic platforms and, potentially, transforming into large-scale businesses. To increase the contribution of small- and medium-sized firms to the economy, obstacles must be eliminated. This research aims to help SMEs develop sustainability indicators while overcoming the difficulties that standard international frameworks bring. The GRI topic list selects the sustainability indicators, which provide a triple-bottom-line approach. First, a limited set of indicators concentrating on the most critical issues for SMEs helps firms focus their attention on the issues that ultimately matter. This paper offers an approach for selecting a set of sustainability indicators that fits the requirements of a worldwide sustainability reporting framework GRI while being specially tailored to the characteristics of SMEs. The Global Reporting Initiative (GRI) G4-specific legal disclosures were utilized to investigate the underlying pattern of dimensions and components of the CS framework for industrial SMEs. G4 had 91 indicators organized into three sub-frameworks: economic, environmental, and social sustainability. The research is being carried out among small- and medium-sized businesses in Izmir, Turkey's third-largest city. The exploratory factor analysis yielded a 12-component outcome, which experts ranked using the Best–Worst Method.

7.1. Theoretical Contributions

This study's theoretical contribution is that it identifies labor rights, energy saving, and human rights as crucial sustainability indicators for industrial SMEs. This study differs from previous studies in that it covers two new dimensions: human rights and the development of economic value for society. Previous research looked at the profitability-related financial characteristics of SMEs as economic sustainability indicators, whereas GRI economic indicators focus on a company's economic value generation with society. This research looks into the economic influence of SMEs on society. According to the findings, SMEs place minor importance on this issue. While product responsibility, compliance, and recycling are considered vital factors, environmental protection and customer relations are less important. Although past research commonly highlighted environmental protection and consumer interactions, this empirical investigation found that these indicators are less prioritized. Most industrial SMEs manufacture and export intermediate items for giant corporations; therefore, they have few customers. As a result, they are less involved in consumer surveys. In Turkey, environmental regulations are ineffective in that sanctions are ineffectual, and infractions of environmental standards are not adequately monitored. Sustainability issues should be fostered by law in terms of public policy consequences. Therefore, legally protected sustainability issues are becoming increasingly extensively used. Prior studies provided a conceptual framework for strengthening key sustainability concerns of stakeholders [46,47] (Russo and Perrini, 2009; Hörisch et al., 2014). Accordingly, building sustainability interests based on these specific concerns is a challenge of managing stakeholder relationships for sustainability. It was argued that regulations and sustainability-based value creation for stakeholders are essential to overcoming these challenges. The management of stakeholder relationships does not necessitate treating all stakeholders regardless of the conditions [48] (Phillips et al., 2003). SME owner-managers should first identify the firm's relevant stakeholders and then evaluate the long-term returns associated with such stakeholder networks [46]. This study provides empirical evidence for the sustainability challenges in SMEs, which were conceptually addressed by prior studies, from a diverse set of stakeholders. The results empirically prove that the sustainability-based value creation for interests of the stakeholders, such as employees who are in the core of business activities, are higher than other stakeholders in SMEs.

7.2. Managerial Contributions

In terms of managerial implications, it may be advantageous to prioritize the sustainability indicators to systematically implement these performance indicators for effectively

developing sustainability. Focusing on essential sustainability measures would assist SMEs in becoming more sustainable businesses. The findings of this study will equip the management of Turkish SMEs with a practical method for defining crucial sustainability indicators and initiating sustainability efforts. According to the results of this survey, when it comes to adopting sustainability, SMEs emphasize employee rights. The methodology to customize the indicators readily applies to various manufacturing industry circumstances. SMEs compete in a dynamic system in which the significance of many factors might shift over time. Hence, the list of sustainability indicators is easily modifiable anytime the conditions that determine the selection of the indicators change.

7.3. Limitations

The small sample size for exploratory factor analysis is one of the primary limitations of this study. Another concern is whether or not this research applies to manufacturing firms in countries other than Turkey. Because sustainability indicators are based on an international framework, they can be adapted, and this is a topic for future research. Further study can be conducted to evaluate the validity of the recommended sustainability indicators by implementing them in manufacturing companies and analyzing the impact on the long-term viability of the operations of those organizations. Furthermore, further research can be conducted on specific industries implementing sustainable development standards. In addition, businesses can apply the approaches established through this study to construct their sustainability criteria.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. G4 corporate sustainability triple-bottom-line framework.

Category	Aspect	No. of Indicators
Economic	Economic performance	4
	Market presence	2
	Indirect economics impacts	2
	Procurement practices	1
Environmental	Materials	2
	Energy	5
	Water	3
	Biodiversity	4
	Emissions	7
	Effluents and waste	5
	Products and services	2
	Compliance	1
	Transport	1
	Overall	1
	Supplier environmental assessment	2
Environmental grievance mechanisms	1	

Table A1. Cont.

Category	Aspect	No. of Indicators
	Employment	3
Social	Labor and management relations	5
	Training and education	3
	Diversity and equal opportunity	1
Sub-category: Labor practices and decent work	Equal remuneration for men and women	1
	Supplier assessment for labor practices	2
	Labor practices grievance mechanisms	1
	Investment	2
	Non-discrimination	2
Sub-category: Human rights	Child labor	1
	Forced or compulsory labor	1
	Security practices	1
	Indigenous rights	1
	Assessment	1
	Supplier human rights assessment	2
	Human rights grievance mechanisms	1
	Local communities	2
	Anti-corruption	3
	Public policy	1
Sub-category: Society	Anti-competitive behavior	1
	Compliance	1
	Supplier assessment for impacts on society	2
	Grievance mechanisms for impacts on society	1
	Customer health safety	2
	Product and service labeling	3
Sub-category: Product responsibility	Marketing communications	2
	Customer privacy	1
	Compliance	1
	Total number of indicators	91

Source: GRI, 2013 [49].

Appendix B

Sustainability indicators and related items used for evaluating the importance and degree of their success for the company.

Respondents were asked to rate the factors on a five-point scale with 1 being the least favorable.

Economic Sustainability

1. G4/EC1: Direct economic value generated and distributed by the organization
2. G4/EC2: Financial implications and other risks and opportunities for the organization's activities due to climate change
3. G4/EC3: Organization's defined benefit plan obligations
4. G4/EC4: Financial assistance received from government
5. G4/EC5: Ratios of standard entry-level wage by gender compared to local minimum wage at significant locations of operation
6. G4/EC6: Proportion of senior management hired from the local community at significant locations of operation
7. G4/EC7: Development and impact of infrastructure investments and services supported
8. G4/EC8: Significant indirect economic impacts generated by the organization
9. G4/EC9: Proportion of spending on local suppliers at significant locations of operation

Environmental Sustainability

10. G4/EN2 (RE1) *: Percentage of materials used that are recycled input materials.
11. G4/EN6 (ES1): Reduction in energy consumption.
12. G4/EN7 (ES2): Reductions in energy requirements of products and services.
13. G4/EN10 (RE2): Percentage and total volume of water recycled and reused.

14. G4/EN12 (EP1): Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of a high biodiversity value outside protected areas.
15. G4/EN19 (EP2): Reduction in greenhouse gas (GHG) emissions.
16. G4/EN27 (GR1): Extent of impact mitigation of environmental impacts of products and services.
17. G4/EN28 (RE3): Percentage of products sold and their packaging materials that are reclaimed by category.
18. G4/EN29 (GR2): Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations.
19. G4/EN30 (GR3): Significant environmental impacts of transporting products and other goods and materials for the organization's operations, and transporting members of the workforce.
20. G4/EN31 (GR4): Total environmental protection expenditures and investments by type.
21. G4/EN32 (GR5): Percentage of new suppliers that were screened using environmental criteria.
22. G4/EN33 (GR6): Significant actual and potential negative environmental impacts in the supply chain and actions taken.

Social Sustainability

23. G4/LA1 (ER1): Total number and rates of new employee hires and employee turnover by age group, gender, and region.
24. G4/LA2 (ER2): Benefits provided to full-time employees that are not provided to temporary or part-time employees, by significant locations of operation.
25. G4/LA3 (ER3): Return to work and retention rates after parental leave, by gender.
26. G4/LA4 (ER4): Minimum notice periods regarding operational changes, including whether these are specified in collective agreements.
27. G4/LA6 (ER5): Type of injury and rates of injury, occupational diseases, lost days absenteeism, and total number of work-related fatalities, by region and by gender.
28. G4/LA10 (ER6): Programs for skills management and lifelong learning that support the continued employability of employees and assist them in managing career endings.
29. G4/LA12 (EE1): Composition of governance bodies and breakdown of employees per employee category according to gender, age group, minority group members and other indicators of diversity.
30. G4/LA13 (EE2): Ratio of basic salary and remuneration of women to men by employee category, by significant locations of operations.
31. G4/LA14 (ER7): The percentage of new suppliers that were screened using labor practices data.
32. G4/HR2: Total hours of employee training on human rights policies or procedures concerning aspects of human rights that are relevant to operations, including the percentage of employees trained.
33. G4/HR3: Total number of incidents of discrimination and corrective actions taken.
34. G4/HR4: Freedom of association and collective bargaining.
35. G4/HR5: Operations and suppliers identified as having significant risk for incidents of child labor, and measures taken to contribute to the effective abolition of child labor.
36. G4/HR6: Operations and suppliers identified as having significant risk of incidents of forced or compulsory labor, and measures to contribute to the elimination of all forms of forced or compulsory labor.
37. G4/HR7: Percentage of security personnel trained in the organization's human rights policies or procedures that are relevant to operations.
38. G4/HR10: Percentage of new suppliers that were screened using human rights criteria.

39. G4/SO1: Percentage of operations with implemented local community engagement, impact assessments, and development programs.
40. G4/SO4 (SC1): Communication and training on anti-corruption policies and procedures.
41. G4/SO7 (SC2): Total number of legal actions for anti-competitive behavior, anti-trust, and monopoly practices and their outcomes.
42. G4/SO9: Percentage of new suppliers that were screened using criteria for impacts on society.
43. G4/PR1 (CR1): Percentage of significant product and service categories for which health and safety impacts are assessed for improvement.
44. G4/PR2: Total number of incidents of non-compliance with regulations and voluntary codes concerning product and service information and labeling by type of outcomes.
45. G4/PR5: Results of surveys measuring customer satisfaction.
46. G4/PR6: Sale of banned or disputed products.
47. G4/PR7: Total number of incidents of non-compliance with regulations and voluntary codes concerning marketing communications, including advertising, promotion, and sponsorship, by type of outcomes
48. G4/PR8 (CR2): Total number of substantiated complaints regarding breaches of customer privacy and losses of customer data.
49. G4/PR9: Monetary value of significant fines for non-compliance with laws and regulations concerning the provision and use of products and services.

* Some codes in the text have been replaced with codes in parentheses.

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