A Proposed Comprehensive Framework for Sustainability Performance Measures. Evidence from Egyptian Industrial Sector

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Abstract

This study aims to propose a comprehensive framework for sustainability performance measure in Egyptian industrial sector.

Based on the literature, this study identifies the drivers of sustainability and related indicators that have the most significant influence on industrial sectors. These drivers and related indicators are used to develop the relationship between drivers and related hypotheses. It also adopted a quantitative research method, using a survey–based approach to collect data from a sample of Egyptian industrial sector.

The most significant finding in the current study that has not been investigated in previous studies is that there is a positive relationship between the integration of environmental, social, and corporate governance indicators and economic sustainability performance. In addition, the environmental sustainability performance indicators have the highest impact on economic sustainability performance compared to social sustainability performance indicators and corporate governance sustainability performance indicators.

The study makes significant contributions to the existing body of knowledge of management accounting literature in different ways. First, it advances sustainability performance indicators literature by developing a comprehensive theoretical framework to categorize these indicators across various drivers. Second, it contributes to the growing body of literature on the relationship between the drivers of sustainability and related indicators (environmental, social, and corporate governance indicators), and Economic sustainability performance, particularly in the context of emerging economies, where research in this area is limited.

Keywords: Sustainability, Environmental indicators, Social indicators, Corporate governance indicators, Economic sustainability performance, performance measures.

إطار مقترح شامل لقياس الأداء المستدام: بالتطبيق علي القطاع الصناعي المصري

ملخص البحث

تهدف هذه الدراسة إلى اقتراح إطار شامل لقياس الاداء المستدام في القطاع الصناعي المصري. بناء علي مراجعة الدراسات السابقة في هذا المجال, تحدد هذه الدراسة محركات الاستدامة الرئيسية وكذلك مؤشرات الاداء ذات الصلة بها والتي لها التأثير الأكبر على القطاع الصناعي. تُستخدم هذه المحركات ومؤشرات الاداء المرتبطة بها   في بناء العلاقة بين متغيرات البحث وكذلك صياغة فرضيات البحث. كما اعتمدت منهجيه البحث علي المدخل الكمي، باستخدام أسلوب قائم على الاستبيان لجمع البيانات من عينة من القطاع الصناعي المصري..

ومن أهم النتائج التي توصلت إليها الدراسة الحالية والتي لم يتم بحثها في الدراسات السابقة هي وجود علاقة إيجابية بين استخدام مؤشرات الحوكمة والمؤشرات البيئية والاجتماعية وبين وأداء الاستدامة الاقتصادية. بالإضافة إلى ذلك، فإن مؤشرات أداء الاستدامة البيئية لها التأثير الأكبر على أداء الاستدامة الاقتصادية مقارنة بمؤشرات أداء الاستدامة الاجتماعية ومؤشرات أداء استدامة الحوكمة المؤسسية.

تساهم الدراسة الحالية مساهمة كبيرة في اثراء المعرفة في مجال المحاسبة الادارية وذلك بعدة طرق. أولاً: اثراء الدراسات المتعلقة بمؤشرات الاداء المستدام من خلال تطوير إطار شامل لتصنيف هذه المؤشرات عبر مختلف المحركات الرئيسية للاستدامة. ثانياً: تُساهم في اثراء المعرفة والدراساتالتي تتناول العلاقة بين محركات الاستدامة والمؤشرات المرتبطة بها (المؤشرات البيئية والاجتماعية ومؤشرات حوكمة الشركات)، وأداء الاستدامة الاقتصادية، لا سيما في الاقتصادات الناشئة، حيث تتسم البحوث في هذا المجال بالندرة.

الكلمات المفتاحية

الاستدامة، المؤشرات البيئية، المؤشرات الاجتماعية، مؤشرات حوكمة الشركات، أداء الاستدامة الاقتصادية، قياس الأداء.

1. Introduction

In recent years, the concept of sustainability has gained increasing importance in the industrial sector, leading to the emergence of sustainability performance indicators. A sustainability performance indicator is a metric that measures how organization is progressing towards sustainability goals (Syahid, et al., 2017).

These indicators are essential for monitoring and evaluating the sustainability performance of industries, as well as designing strategies for improvement. Sustainability performance indicators provide a systematic framework for assessing an organization's sustainability performance. In recent years, there has been a growing emphasis on the integration of environmental, social, and corporate governance factors with traditional financial indicators in evaluating the overall performance of businesses. This integrated approach provides a more comprehensive understanding of a company's sustainability and long-term viability, as it accounts for the complex interplay between environmental, social, and governance practices, and their impact on financial performance (Whitelock, 2019).The need for such a framework is driven by the increasing demand from stakeholders, including investors, customers, and regulators, for companies to demonstrate their commitment to sustainable and responsible business practices (Kocmanová et al., 2016). The integration of these multidimensional factors can help organizations identify their strengths and weaknesses and develop strategies that align with the principles of sustainable development. However, there is a lack of studies which focused on the comprehensive framework that includes all sustainability drivers and related indicators. In addition, there is also a lack of literature that examined the relationship between such indicators in developing countries. In the developing world, there still a scarcity of research on sustainability performance models, particularly in Africa.

Moreover, while there are studies focusing on sustainability performance indicators in various contexts, there is a lack of sector-specific sustainability performance indicators models. Most existing models are broad and generic,

applicable to multiple sectors, which limits their effectiveness in meeting specific sector requirements (Trianni, et al., 2019).

This research aims to address this knowledge gap by proposing a comprehensive, multidimensional framework for integrating environmental, social, and corporate governance indicators with economic sustainability performance measures (including traditional economic and sustainability economic performance indicators). In addition to examine the relationships in the proposed framework in the Egyptian Industry. The framework draws on stakeholder theory as the underlying theoretical basis, emphasizing the importance of aligning the needs and expectations of various stakeholders in the pursuit of sustainable success. (Journeault, 2016; Whitelock, 2019; Vărzaru et al., 2021).

This research will answer the following research questions:

1– Is there association between the proposed environmental indicators and the Economic Sustainability Performance in Egyptian industrial sector?

2– Is there association between the proposed social indicators and the Economic Sustainability Performance in Egyptian industrial sector.

3– Is there association between the proposed corporate governance indicators and the Economic Sustainability Performance in Egyptian industrial sector.

4– Is there relationship between the comprehensive framework which include all drivers and Economic Sustainability Performance in Egyptian industrial sector.

In order to achieve the purpose of this study and answer the research questions, the following objectives are adopted:

1–Proposing Environmental indicators in the industrial sector that anticipated to have strong impact on Economic performance

2– Proposing social indicators in industrial sector that anticipated to have strong impact on Economic performance

3– Proposing corporate governance indicators in industrial sector that anticipated to have strong impact on Economic performance

4– Proposing a comprehensive framework which consists of all proposed drivers and examine its impact on Economic performance

It is conducted in the Egyptian industrial sector, focusing on industrial organizations, specifically manufacturers and assemblers. A questionnaire survey gathers data on sustainability performance indicators and their relationship. A questionnaire survey is conducted to collect the data. Survey was conducted by distributing the questionnaires to all manufacturers with ISO 14001 certification in Egypt that were listed in The Federation of Egyptian Industries Directory. A total of 60 ISO14001 certified manufacturers were identified and therefore used as the sampling frame. After excluding incomplete questionnaires, 134 valid questionnaires were retained for analysis, representing an effective response rate of 74.4%. The collected data is analyzed by using the Statistical Package for the Social Sciences (SPSS) software. Inferential statistics are used to test the hypotheses (Trianni et al., 2019).

Accordingly, this study contributes to the literature on sustainability performance by providing (i) a theoretical comprehensive framework which includes all sustainability drivers and related indicators for evaluating the sustainability performance of industry sector (ii) empirical evidence from a leading emerging economy, and (iii) practical implications for industrial and policy decision–makers.

The rest of this paper is structured as follows. Literature reviews and creating the theoretical framework and developing. The third section presents the research methodology, while the fourth and fifth reveal the findings and discussion of the results. The last section presents a summary of the findings and limitations of the research and implications of the research for future studies.

2. Literature Review

This section is divided into 3 sub-sections. The first one is the literature related to the selection of sustainability drivers. The second one is literature related to the indicators. Finally, the literature related to the relationship between the indicators of all drivers.

2.1 Literature Related to the Selection of Sustainability Drivers

According to Guy & Kibert, (1998); Searcy, (2011); Journeault, (2016); Whitelock, (2019); measuring organizational sustainability has become more important to face the increasing demand from stakeholders for greater transparency and accountability from corporations. Moreover, focusing on sustainability has made measuring organizational performance more complicated — it is no longer enough to rely solely on financial performance metrics. These studies affirm that focusing on sustainability increases the pressure on companies to include environmental and social dimensions as well as the financial one in their performance evaluation system.

This is supported by Moursellas et al., (2022) who explored the sustainability practices and performance in European small and medium enterprises and identified that the combination of economic, environmental, and social factors is the key factor to accomplish sustainability goals.one of the most important filed nowadays is how to use the Accounting to support sustainability reporting.

The main purpose of sustainability reporting is not only disclosing sustainable information but also measuring and reporting the achieving of sustainable goals. Filatova et al., (2023) reported that the objective of sustainable development should include environmental dimension, such as the effect of business activities on natural systems. This study also suggested including of social responsibility that provides social benefits to employees and enhancement the quality of the environmental conditions in which they live. Furthermore, they also suggested including the economic responsibility

which considers the economic conditions of stakeholders and the broader economic system.

Hubbard (2006); Atağan (2016); Sulbahri et al. (2022); Filatova et al. (2023) have suggested a sustainability measurement framework that includes the corporate governance indicators. According to these studies corporate governance indicators are key components in the holistic sustainable performance measurement. Factors related to corporate governance, including the board composition, the structure of executive compensation and risk management, can also impact companies' ability to meet their sustainability goals. Gross (2015) agreed that corporate governance indicators should be integrated with social and environmental indicators to generate sustainable value and enhance competitive advantage of the organization. By incorporating these dimensional aspects, sustainability indicators develop a holistic view and understanding of the complex cause–and–effect relationships between companies, society, and environmental context (Guy & Kibert, 1998).

The studies of Kocmanova &., Dočekalová (2011), and Kocmanova and Simberova (2014) affirm that the Integration between Social, environment and corporate governance indicators in the company strategy is crucial as financial indicators may not depict an accurate picture of total performance.

A review of the existing research on sustainability dimensions in the manufacturing sector reveals a growing emphasis on the need for a holistic approach. The Comprehensive sustainability performance measurement should not only capture economic, environmental, and social outcomes but also integrate corporate governance drivers that can influence an organization's ability to achieve its sustainability goals.

2.2 Literature Related to the Indicators

Syahid et al. (2017) explore sustainability indicators within Enterprise Resource Planning (ERP) systems context. Through their systematic literature review, they provide several sustainable operation indicators typically used in the manufacturing industry, pointing to the challenges of choosing appropriate

indicators for environmental, social, and economic performance. This highlights the importance of well-defined indicators as a key step in the evaluation of sustainability.

The main purpose of the study of Aguilar et al. (2019); and Gani et al., (2023) is to consolidate the socio-economic dimensions for sustainability in the manufacturing context. By doing a thorough literature review, the study outlined relevant indicators from different literature to give a more comprehensive picture of an organization's sustainability performance.

Guo & Wu, (2022) proposed a new approach to evaluate social sustainability within the supply chain and highlights the importance of an effective framework for evaluating performance indicators. This study emphasized that health and safety are vital aspects of social sustainability. It also indicated that these dimensions should be explored more in relation to organizational performance.

Other studies have focused on the challenges and scope of energy management in achieving sustainable industrial development. These studies highlight the importance of energy efficiency and management in improving the overall sustainability of the industrial sector (Aflaki et al., 2012); (Gazi et al., 2012); and (Urbano & Viol, 2020).

The studies of Fan et al., (2010); Sneha et al., (2016); Khurana et al., (2019); and Gani et al., (2023) Focused on exploring the relevant key indicators for all dimensions, including energy management, productivity, innovation, and workforce well-being. According to these studies, the identification of relevant indicators is crucial step for achieving sustainable industrial development.

Unterkalmsteiner et al., (2023) proposed a conceptual framework of indicators. These proposed indicators are used in evaluating sustainability performance. This proposal offers a valuable starting point for future applications of this framework and contributing to the ongoing argument on the impact of sustainability indicators on the company's performance

2.3 Relationship between Drivers and Related Indicators.

Most of the existing literature explores the relationship between sustainability (environmental, social, and governance) and the economic dimensions measured through financial indicators at the aggregate company level. These literatures have produced mixed results and increasingly indicated the significance of sustainability in different sectors. Some studies have shown a positive relationship between such practices and financial, operational and reputational outcomes, meaning that good sustainability practices lead to better outcomes. Other studies reported more nuanced relationships emphasizing the need to balance economic, environmental, and social dimensions (Moursellas et al., 2022).

 (N. et al. 2018) examined the relationship between sustainability performance and financial outcomes. The results of this study indicated that traditional Environmental, Social, and Governance (ESG) indicators are positively correlated with financial performance. It also proposes new indicators that can be used to better reflect the modern sustainability practices. This study and related results provide an essential contribution to current literature and highlighted the relationship between sustainability and objective of organizational performance. This is further supported by Moursellas et al., (2022) who reported more nuanced relationships, highlighting the importance of balancing economic, environmental, and social dimensions.

Malesios et al., (2018) extend this discussion by focusing on small– and medium–sized enterprises (SMEs) and related sustainability practices. The main aim of this study is to empirically investigate the association between sustainability performance and economic growth and develop approaches that consider sector–specific characteristics. The model used by this study focuses on the importance of using new effective strategies that will be able to understand the effect of sustainability on SME performance.

The literature is further enriched with the framework for sustainable supply chain management, as did Yun et al., (2018). They explain how addressing social issues embedded in operational practices can improve economic

outcomes, better demonstrating that efforts towards sustainability can generate operational and financial returns. Their research demonstrates that social and economic performance are intertwined in such a way that organizations must adopt a comprehensive approach to sustainability.

Bartolacci et al., (2020) conduct an extensive bibliometric analysis of the relationship between sustainability and financial performance in SMEs. The systematic review highlighted major themes and gaps in the sustainability management literature, arguing that we need to understand how sustainability management tools can improve companies' performance. This work highlights that research is still needed to effectively integrate the theoretical with the practical components of sustainability in SMEs.

Literature collectively underscores the critical role of sustainability performance indicators in enhancing organizational performance across various dimensions. They also emphasis that the integration of these indicators into organizational practices is essential for driving performance while fostering environmental and social responsibility. However, the literature on sustainability research emphasized the need for further research on identifying and measuring the drivers of sustainability, as well as exploring the relationship between these drives (Magon et al., 2018).In addition, further studies are needed to develop a holistic approach to sustainability indicators in the manufacturing sector. This holistic approach needs to consider not only environmental factors but also corporate governance and social indicators for a more comprehensive understanding of an organization's sustainability performance. Moreover, further research is also needed to explore the impact of such a holistic approach on economic sustainability performance. This study aims to address the gap in the literature by the following: 1– proposing a comprehensive framework which includes all sustainability drivers and related suggested indicators. 2– examine the relationship between environmental, social, and corporate governance, and economic sustainable performance. 3– In addition, it examines the relationship between the integration of environmental, social, and corporate governance, and economic sustainable

performance in Egyptian industrial sector which is not addressed in the previous studies.

3. The Development of the Theoretical Framework and Related Hypotheses

3.1 The Development of the Sustainability Performance Measure Framework

In the 21st century, sustainability has been an issue at the forefront of the socio–political and economic agendas of governments, businesses and individuals alike, all trying to cater to the challenge of finding ways to meet the needs of the present without compromising the ability of future generations to meet their own needs. Developing and implementing appropriate sustainability indicators to track progress is one of the most important challenges in this regard. (Barbier & Burgess, 2015).

 Sustainability is a multi–dimensional aspect which consists of three volatile components: economic, social, and environmental oriented. In addition, the previous study also indicated that corporate governance adaptation was an influential driver for sustainability. Thus, it is essential for sustainability indicators to be integrated. Such an integration provide a comprehensive understanding of the complex relationships between these dimensions. (Renn et al., 2020).

Sustainability indicators are measurable values to analyze and evaluate the economic, social, corporate governance and environmental performance. They can also highlight the areas that are improving or require further action. (Guy & Kibert, 1998).

Choosing sustainability indicators is a value–driven process; since there is complex cause–and–effect relationships between environmental, social, and economic factors, that should be considered. (Guy & Kibert, 1998). Developing effective sustainability indicators is a complex process that needs data from multiple stakeholders. Engagement of stakeholders in the process is important to ensure that the indicators will be appropriate and relevant for the communities they will serve.

Moreover, the indicators should be sensitive to changes in the system and be explicitly informative that can help managers in decision making (Reed et al., 2005). In order to develop effective indicators, the delicate balance of stakeholder engagement, scientific rigor, and practical considerations must be considered. The adoption of such effective indicators provides companies with valuable insights into their progress towards a more sustainable future and make informed decisions that will help them to meet their sustainability goals(Smith & Taylor, 2000 ; Reed et al., 2005; and Magee & Scerri, 2012).

In the field of indicator development, another crucial aspect is the trade-off between parsimony (using few indicators), versus comprehensiveness, (covering all relevant dimensions of sustainability) (Merino-Saum et al., 2020). It may seem appealing to attempt to create a set of indicators that includes every aspect of sustainability, this may lead to an unmanageable and difficult – to– use indicator system . In fact, research points out that tracking a small number of selected indicators provide a clearer and more actionable picture of sustainability than tracking many indicators. (Merino-Saum et al., 2020).

Based on the findings of the literature review, the current study proposes a holistic framework for sustainability–related performance measurements within the Egyptian industrial sector. This framework encompasses the four key drivers of sustainability: environmental; social; corporate governance; and economics. The proposed framework incorporates all four drivers to present a holistic approach to determining the sustainability–related performance of the Egyptian industrial sector.

Here the key indicators of each driver were taken from literature related studies specifically based on the industrial sector. The indicator framework based on each driver and their proposed measures are detailed below in tables 1;2;3; and 4. Table 1 illustrates the environmental driver and their proposed measures

Table 1: The proposed Environmental indicators in industrial sector

Key proposed Indicators	Measures
Cost of air emission treatment	cost of air emission treatment /total production costs
water usage efficiency	Water Consumption (m^3) / Units Produced
Use of recycled material	use of recycled material/total material used
waste reduction rate	total waste generated/total production
waste recycling rates	using recyclable waste/total waste
Hazardous waste amount reduction due to material substitution	absolute number
Energy Consumption per Unit of Production	total energy consumption kwh/production, units or tons
renewable energy utilization	using renewable energy/total energy

Source: Adapted from: Jurgis & Valdas,(2009);Vermeulen et al., (2012); Sneha et al., (2016); Smit & Magdalena, (2016); Syahid et al., (2017); Trianni et al., (2019); and Nicoleta et al., (2020).

The social driver and their proposed measures are illustrated in table 2 as follows:

Table 2: The proposed social indicators in the industrial sector

Key propose Indicators	Measures
Number of new employees	Number of new employees per year
accidents due to working condition	Number of accidents due to working condition
Percentage of employees that participated in training programs related to sustainable development	Number employees that participated in training programs related to sustainable development/All employees that must be trained
Involvement in local community	Degree or percentage of Involvement in local community
Education level	Average of education level per total employees
Healthcare service	Degree or percentage of health service level or budget
Discrimination level or percentage	Degree or percentage of discrimination
Diversity	Degree or percentage of diversity across various dimensions

Source: Adapted from Jurgis & Valdas,(2009);(Mani et al., (2014); (Harik et al., (2015); Trianni, & Cagno, (2019); Cherrafi et al.,(2021); and Aldaadi, (2021).

The corporate governance driver and their proposed measures are illustrated in table 3 as follows:

Table 3: The proposed corporate governance indicators in the industrial sector

Key proposed Indicators	Measures
information about company	Information about the objectives of the company Information on the financial results Information from control activities
Responsibility Corporate governance	Profitability from total capital Report on the activities in environmental and social areas Sumit a collective report
Ethical behavior	Code of ethics (relation and responsibility towards a professional community, to staff, to clients, to investors).
Remuneration Corporate governance	Total financial amount of the Board and Supervisory Board remuneration*100/total labor costs
Effective composition of corporate governance	Number of independent members CG *100 divided by number of members top management of the company.
Equal opportunities: Ratio of women/men in CG	% representation of women and men to the total number of CG.
Corruption	% of disputes
Observance of legal standard	Cash value of more significant fines and the total number of non–monetary penalties for non–compliance with laws and regulations

Source: Adapted from: Kocmanová & Simberová (2014).

The Economic driver and their proposed measures are illustrated in table 4 as follows:

Table 4: **The proposed Economic indicators in the industrial sector**

Key proposed Indicators	Measures
Research and development investment	Investment in research and development /total sales
Cost reduction result from Sustainability Initiatives/innovations	identifying reduction in the resource usage that results from Sustainability Initiatives/innovations and its impact on cost reduction
Growth of economics	Degree or Percentage of profitability
Process technology level of usage	Degree or Percentage of using new technology
Revenue from Sustainable Products	Identify the revenue generated from product offerings designed with sustainability focusing
Sustainable Product development cost	Total product development cost/ total cost
sustainable investment	investment in environmentally and socially responsible initiatives/ Total investment

Source: adapted from Rukšenaitė, (2009); Jurgis & Valdas,(2009); Dziallas & Blind, (2018); Tieber et al., (2019), and Trianni, & Cagno, (2019).

3.2 Variables, Research Questions and Development of Hypothesis

3.2.1 The Identifying of Variables

The second phase of developing the theoretical framework is to identify the variables of the model and hypotheses. The proposed model includes the following variables:

● Independent variables: Sustainability performance indicators, including environmental, social, and corporate governance.

● Dependent variable: Economic sustainability performance indicators.

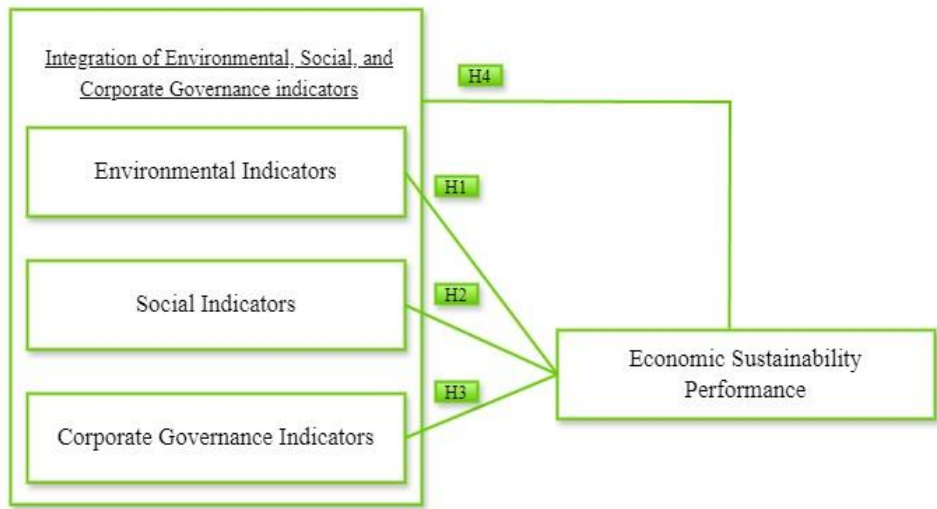The relationship between variables can be illustrated in the following figure:

Figure 1: **Proposed framework for sustainability performance measures**

3.2.3 The Research Hypotheses of this Study are:

H01. There is no association between the use of the proposed environmental indicators and the Economic Sustainability Performance in Egyptian industrial sector.

Ha1. There is association between the use of the proposed environmental indicators and the Economic Sustainability Performance in Egyptian industrial sector.

H02: There is no association between the use of the proposed social indicators and the Economic Sustainability Performance in Egyptian industrial sector.

Ha2: There is association between the use of the proposed social indicators and the Economic Sustainability Performance in Egyptian industrial sector.

H03: There is no association between the use of the proposed corporate governance indicators and the Economic Sustainability Performance in Egyptian industrial sector

Ha3: There is association between the use of the proposed corporate governance indicators and the Economic Sustainability Performance in Egyptian industrial sector.

H04: There is no relationship between the integration of environmental, social, and corporate governance indicators and the Economic Sustainability Performance in Egyptian industrial sector

Ha4: There is a relationship between the integration of environmental, social, and corporate governance indicators and the Economic Sustainability Performance in Egyptian industrial sector.

4. **Methodology**

The first phase of this study consists of an extensive literature review of the sustainable performance indicators in the industrial sector. Based on the literature review and the specific context of the Egyptian industrial sector, the current study selects a set of sustainability–related indicators that cover the environmental, corporate governance, social dimensions, and economic.

The second phase seeks to enhance the power of generalization of the relevance of the sustainable indicators framework and the relationship between the environmental, social, and corporate governance, and economic indicators across the perception of a wide range of professionals working in the industry. Quantitative research design is employed to achieve the purpose of this study. The data was collected through a survey of senior–level managers and executives. survey was conducted by distributing the questionnaires to all manufacturers with ISO 14001 certification in Egypt that were listed in The Federation of Egyptian Industries Directory. A total of 60 ISO 14001 certified manufacturers were identified and therefore used as the sampling frame.

The questionnaire included questions about the organization's demographics, sustainability performance indicators, and organizational performance. It was divided into three main groups of sustainability performance indicators: economic, environmental, and social. Prior to data

collection, the questionnaire was assessed by two experts in statistics to ensure clarity and accuracy. The questionnaire was also pre-tested on five significant individuals from the manufacturing industry for content validity and reliability. To gather responses, the questionnaires were delivered via email to professionals working in the Egyptian industrial companies with ISO 14001. A follow-up was conducted four weeks after the initial request to encourage participation. Out of the 180 questionnaires administered to the companies working in the industrial sector, 148 were returned, representing a response rate of 82.2%. After excluding incomplete questionnaires, 134 valid questionnaires were retained for analysis, representing an effective response rate of 74.4%.

This is an acceptable response rate for studies targeting this type of research sample. The respondents' designation included CEO, chairperson, president, managing director, operations manager, and other equivalent positions (in the planning, development, or technical office). (78.4%) were from males, and (21.6%) were from females. Most of the respondents (51.2%) had more than 20 years of experience, while 24.8% and 18.4% had between 11 and 20 years and between 6 and 10 years of experience, respectively. Only 5.6% had 5 years or less experience. Concerning the organizational workforce size, 36.8% of the firms employed more than 1000 employees, 31.2% had between 500 and 1000 employees, while 19.2% and 12% of the firms had between 100 and 500 employees and fewer than 100 employees, respectively.

Data gathered from questionnaires were examined in terms of their validity and reliability. Factor analysis, correlation analysis and multiple regression analysis methods were used to analyze the empirical data.

5. Data Analysis

This section aims to investigate the association between the individual drivers of environmental, social, corporate governance, and economic sustainability indicators. Furthermore, it investigates the relationship between the integration of environmental, social, and corporate governance, and

economic sustainability indicators for industrial Egyptian companies. To achieve these purposes, the following steps are used: (1) factor analysis (2) Cronbach's Alpha to test the reliability of each factor (3) multiple regression to investigate the influence of the Integration of the three drivers on economic sustainability performance. (4) **Correlation Analysis to** Measure the strength and direction of the linear relationship between ESG drivers and economic sustainability indicators.

5.1 factor analysis

The current study uses factor analysis for structure detection purposes in order to examine the underlying relationships between variables.

5.1.1 Determine the Extraction Method.

To determine the extraction factor method, normality distribution test should be applied. When the data is normally distributed, the best choice is to use the Maximum Likelihood technique. On the other hand, if the assumption of multivariate normality is violated, the best choice is to use the Principal Axis Factoring technique. The current study used the one-sample Kolmogorov-Smirnov. The one-sample Kolmogorov-Smirnov is used to test the null hypothesis that a sample comes from a particular specified normal distribution. A significant result of less than .05 means that the distribution is not normal (Howitt and Cramer, 2008) (See table 5).

Table 5: The one–sample Kolmogorov–Smirnov test results

Variables	Statistic	Significant
Environmental indicators	.045	.2000
Social indicators	.073	.172
Corporate governance indicators	.071	.164
Economic sustainability performance	.047	.733

Table 1 shows that P for all variables > 0.05. So, the Kolmogorov–Smirnov test results suggest that all variables follow a normal distribution in the entire population.

5.1.2 Results of Factor Analysis and Reliability

Structural factor analysis is applied to variables. Common Factor Analysis is used. Due to the normality of variables, the current study adopted the Maximum Likelihood technique as the extraction method. factor analysis was run for twenty–three items (see table 6).

Table 6: The Results of Factor Analysis

Factors	Loading	Eigen Value	Variance Explained	Reliability Analysis
Environmental Dimension		3.6	20%	.89**
Cost of air emission treatment is a key indicator that can be used to measure environmental dimensions of sustainability	.69			
Water usage efficiency is a key indicator that can be used to measure environmental dimension of sustainability Use of recycled material is a key indicator that can be used to measure environmental dimension of sustainability	.79			
Waste reduction rate is a key indicator that can be used to measure environmental dimension of sustainability	.79			
Waste recycling rates is a key indicator that can be used to measure the environmental dimension of sustainability	.88			
Hazardous waste amount reduction due to material substitution is a key indicator that can be used to measure environmental dimension of sustainability	.78			
Energy Consumption per Unit of Production is a key indicator that can be used to measure environmental dimensions of sustainability	.69			
Renewable energy utilization is a key indicator that can be used to measure environmental dimension of sustainability	.78			
	.88			
Social Dimension		3.2	18%	.92**
Number of new Employment is a key indicator				

Factors	Loading	Eigen Value	Variance Explained	Reliability Analysis
that can be used to measure social dimension of sustainability	.89			
Accidents due to working conditions are a key indicator that can be used to measure the social dimension of sustainability	.85			
Percentage of employees that participated in training programs related to sustainable development is a key indicator that can be used to measure social dimension of sustainability	.87			
Involvement in the local community is a key indicator that can be used to measure social dimension of sustainability	.83			
Education level is a key indicator that can be used to measure social dimension of sustainability	.88			
Healthcare services are a key indicator that can be used to measure social dimensions of sustainability	.87			
Discrimination level or percentage is a key indicator that can be used to measure social dimension of sustainability	.82			
Diversity level is a key indicator that can be used to measure social dimension of sustainability	.84 .80			
Corporate governance Dimension		2.9	15%	.88**
Information about company	.86			
Responsibility Corporate governance	.75			
Ethical behavior	.86			
Remuneration Corporate governance	.76			

Factors	Loading	Eigen Value	Variance Explained	Reliability Analysis
Effective composition of corporate governance	.70			
Equal opportunities: Ratio of women/men	.75			
Corruption	.67			
Observance of legal standard	.70			
Economic Dimension		2.5	12%	.90
Research and development investment	.80			
Cost reduction result from Sustainability Initiatives/innovations	.85			
Growth of economics	.86			
Process technology level of usage	.70			
Revenue from Sustainable Products	.85			
Sustainable Product development cost	.89			
sustainable investment	.88			
Total variance explained	.65%			

Table 6 shows that all thirty-one items included in the analysis have communality values ranged from .6 to .8, which are common magnitudes in social science (Velicer and Fava, 1998). In addition, most factor loadings are greater than .69 which is "very significant" and indicates a strong correlation between items and the factor they belong to (Hair et al., 1998). Furthermore, all items are loaded highly on only one factor and are not split loaded on another factor above .32 (Tabachnick and Fidell, 2001). The factor analysis suggests four factors solutions, with eigenvalues of 1.0 or above are extracted and thirty-one items are retained under the four factors which explain 65% of the variance in the data set. The first factor for 20% of the variance, the account for 18%, the third accounts for 15%, and the fourth account for 12%

For reliability analysis, Cronbach's alpha is calculated to test reliability and internal consistency for each factor. The result indicates that the Alpha coefficient for all factors is above 87% which is higher than the standard estimates of .70 (Howitt and Cramer, 2008).

The factors are labelled according to the commonality of items loading on each factor and are as follows: Environmental indicators, social indicators, **corporate governance** indicators and economic indicators.

5.2 Hypotheses Tests

This study adopted two statistical analysis techniques to test the Hypotheses of the study. Correlation test is adopted to test the association between the individual drivers and the economic sustainability performance to measure the strength and direction of the linear relationship between ESG dimensions and economic sustainability performance (hypotheses 1;2; and 3). Moreover, Multiple regression analysis is used to test hypothesis four.

5.2.1 *The Association between the Individual Drivers of ESG and Economic Sustainability Performance*.

Pearson correlation is adopted to test the association between the individual dimensions and the economic sustainability performance to measure the strength and direction of the linear relationship between ESG dimensions and economic sustainability performance. The Pearson correlation is used because the distribution of data was normal (see table 5). The results of this test is illustrated in table 7.

Table 7: **Correlation test**

Variables	Economic indicators
Economic indicators	1.00
Environmental indicators	.91
Social indicators	.89
Corporate governance indicators	.70

The current study has used the guideline suggested by Hair et al. (2007) for interpreting the strength of association of correlation coefficients. Table 8 summarizes the ranges of correlation coefficients and how they are interpreted

Table 8: The Interpretation of Correlation Coefficient's Ranges

Ranges of correlation coefficient	Associations
+ – .91 to + – 1.0	very strong
+ – .71 to + – .90	high
+ – .41 to + – .70	moderate
+ – .21 to + – .40	small but definite relationship
+ – .00 to + – .20	slight, almost negligible

The correlation analysis revealed that environmental indicators was positively and very strong correlated with economic performance with correlation coefficients of 0.91 (p < 0.01). Such a result suggests that there is a positive and **very strong** association between the proposed environmental indicators and economic sustainability performance. Therefore, Alternative hypothesis one is accepted.

Additionally, social indicators were highly and positively correlated with economic sustainability performance with correlation coefficients of,0.89 (p <0.01). Such a result suggests that there is a positive and **high** association between social indicators and economic sustainability performance. Therefore, Alternative hypothesis two is accepted.

Moreover, Corporate governance indicators had moderate correlation with economic sustainability performance, with correlation coefficients of 0.70 (p <0.01).Such a result suggests that there is a positive and **moderate** association between corporate governance indicators and economic sustainability performance.Therefore, Alternative hypothesis three is accepted.

It can be concluded that the environmental indicators have the strongest association with organizational performance. This means that environmental indicators have the greatest impact on economic sustainability performance. Followed by social indicators, and corporate governance respectively.

5.2.2 Relationship between the Proposed Integrated Three Drivers of ESG and Economic Sustainability Performance.

Regression analysis was used to examine the relationship between the proposed indicators of the environmental, social, and corporate governance, and economic sustainability performance. Multiple regression analysis was performed to test hypothesis four suggested in the study. Before running the regression tests, the assumptions of the model are tested to ensure that they are not violated.

5.2.2.1 Regression Analysis Assumption Tests

Assumption 1: normality (see table 5). It can be concluded that the normality assumption is not violated.

Assumption 2: The values of residuals are independent. The Durbin–Watson statistics are used. In the current study Durbin–Watson is close to 2 (1.923). Therefore, the assumption has been met.

Assumption 3: There is no multicollinearity in independent variables. The variance inflation factor (VIF) and Tolerance are computed. In this study, the maximum VIF is 4.36 which is < 10 and the maximum Tolerance is .735 > .2. This indicates that there is no collinearity problem in the model. So, the assumption of collinearity is satisfied.

Assumption 4: There are no influential cases biasing in the model. This can be tested using Cook's Distance. Cook's Distance values were all under 1. This means that cases were not unduly influencing the model. Therefore, the assumption has been met.

In summary, it can be concluded that the assumptions of regression analysis are satisfied

5.2.2.2 Regression analysis results

The current study uses the following formula for multiple linear regression:

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3$$

Where:

Y = the predicted value of the dependent variable (Economic sustainability performance indicators.

b_0 = the y–intercept (value of y when all other parameters are set to 0)

$b_1 X_1$ = the regression coefficient (b_1) of the first independent variable (X_1) (environmental indicators) (the effect that increasing the value of the independent variable has on the predicted y value)

$b_2 X_2$ = the regression coefficient (b_2) of the first independent variable (X_1) (social indicators) (the effect that increasing the value of the independent variable has on the predicted y value)

$b_3 X_3$ = the regression coefficient (b_3) of the first independent variable (X_3) (corporate governance indicators) (the effect that increasing the value of the independent variable has on the predicted y value)

The results of Multiple regression analysis are summarized in table 9 as follows:

Table 9: **Result of multiple regression**

Model	R	R Square	Adjusted R Square	F	Sig
5	.760	.577	.559	33.291	.000

Variable: Economic sustainability Performance

Constant: environmental indicators, social indicators, and corporate governance indicators.

The results indicated that there is a positive significant relationship between the integrated proposed indicators for environmental, social, and corporate governance drivers and the Economic sustainability Performance of the Egyptian industrial (R =.760)

The model demonstrated a significant overall fit F =33.291, P<.005, With R Square of .577, indicating that approximately 58% of the variance in the Economic sustainability Performance could be explained by the relationship with the integrated model which includes all indicators of all drivers. and 42% and variation is caused by factors other than the predictors included in this model. This suggests that the proposed framework can significantly contribute to the enhancement of the economic sustainability performance

within Egyptian industrial companies. Therefore, Alternative hypothesis four is accepted.

6. **Discussion and Implication**

The results indicate that the proposed model is suitable for evaluating the sustainability performance of industrial enterprises, as the indicators can effectively sustainability performance. Moreover, the significant and positive relationship between indicators of sustainability performance (for environmental, social and corporate governance) and economic sustainability performance according to this study shows that there are economic benefits of integrating sustainability into organizational operation. Additionally, these economic benefits can be measured using the proposed indicators that were focused not only on financial measures but also on economic sustainability measures. Furthermore, the results also prove that environmental indicators received the greatest relative importance in comparison with the social and corporate governance indicators. The proposed sustainability performance evaluation framework, along with a set of sustainably performance indicators, would allow industrial firms to monitor and measure their sustainability performance (Trianni et al., 2019).

Findings of this study are consistent with previous studies that emphasized the need of having balance between the economic, environmental, and social aspects (Moursellas et al., 2022). The current study is also supported by the studies of (Malesios et al., 2018; Yun et al., 2018; and Bartolacci et al., 2020). These studies focused on the sustainability practices in small- and medium-sized enterprises (SME). They shed empirical light on the relationship between sustainability performance and economic growth at the country level and the country-sector level, respectively. The findings of the current study further validate these findings in the context of the Egyptian industrial sector and use comprehensive framework.

This paper elucidated on some major implications for the Egyptian industrial sector and policymakers based on the findings from this study.

This model incorporates all dimensions from environmental, social, corporate governance and economic necessary for sustainable value creation, providing a comprehensive perspective to the Egyptian industrial sector for both evaluating and upholding sustainability in order to produce capital value for the business and culture. Moreover, the identification of key sustainability indicators with respect to their relative importance helps companies and policymakers prioritize their sustainability strategies and allocate resources appropriately. A further application of a sustainability index is to serve as a benchmarking tool, through which the progress of individual companies and the whole industrial sector can be monitored over a period of time. Furthermore, such findings will be beneficial to policymakers in developing specific policies and incentives that promote sustainability in the Egyptian industrial futures, including investment in green technologies, skills development, and regulatory frameworks. For practitioners the study demonstrates the strategically important role of performing sustainability measures and integrating them. Industrial corporations in Egypt can utilize these insights to establish stronger sustainability strategies, allocate resources more efficiently, and improve their competitiveness and long–term sustainability. Hence, Egyptian industrial firms might think about investing in sustainability practices as a way to improve their performance and competitiveness.

For other developing countries battling with the same sustainability challenges in their industry, the research can be used as guidelines. This developed framework can be further modified and improved according to the context of other fields, further broadening the spectrum of research and project–related performance metrics pertaining to sustainability in the industry.

7. **Conclusion**

This study aimed to propose a comprehensive framework of sustainability performance drivers and related indicators in the Egyptian industrial sector.

Using perceptions' data from a survey of assessors of Egyptian industrial sector' compliance with environmental and industrial quality standards, the research hypotheses were tested applying the correlation and regression approach. The overall findings indicate that:

1– Sustainability performance indicators for environmental driver have a positive association with economic sustainability performance.

2– Sustainability performance indicators for social driver have a positive association with economic sustainability performance

3– Sustainability performance indicators for corporate governance driver have positive association with economic sustainability performance.

4– The environmental indicators have the greatest impact on economic sustainability performance. Followed by social indicators, and corporate governance respectively.

5– One of the key findings of this study is that there is a positive relationship between the integration of environmental, social, and corporate governance indicators and economic sustainability performance which proposed to measure economic sustainability.

The research findings can support the Egyptian Ministry of Environment efforts to increase firms' compliance with environmental and industrial quality regulations by providing an additional justification for implementing such regulations.

The study makes important contributions to the existing body of knowledge on sustainability performance indicators different ways. First, it advances sustainability performance indicators literature by developing a comprehensive theoretical framework to categorize these indicators across various dimensions. Second, It contributes to the growing body of literature on the relationship between sustainability dimensions of environmental,

social, and corporate governance, and Economic sustainability performance, particularly in the context of emerging economies, where research in this area is limited (Aboud & Diab, 2018; and Sardana et al., 2020).

This study is not free from several limitations that need to be considered when assessing the results and determining future research avenues. A key limitation is the focus on Egyptian industrial, as this limits the generalizability of the findings (Trianni et al., 2019). While comparison on a sector basis is possible, given the focus on manufacturing, differences in governance and local contexts hinder wider generalizability. While industrial in Egypt are a relevant context for investigating the sustainability performance indicators–organizational performance relationship, broadening the analysis to other sectors and countries would increase the generalizability of the findings.

In light of the limitations mentioned above and the study's findings, future research is suggested to focus on the following issues. This study investigated the impact of only a certain number of sustainability performance indicators. Future research could test a larger number of sustainability performance indicators and cover a wider range of industrial activities. Furthermore, this study was limited to the Egyptian industrial sector. Empirical studies in other sectors or countries would provide comparative results for extending generalizability. Moreover, this study is cross–sectional in nature; thus, it provides a snapshot of the current situation without guaranteeing the stability of the results over time. Longitudinal research might offer insights into changes in potential relationships over time, their magnitude, and the influence of other variables. Finally, this study used regression analysis to analyze and interpret the relationships between sustainability performance indicators and economic sustainability performance. Future research might adopt more advanced modeling techniques to capture the complexities of these relationships in greater depth.

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