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# THE IMPACT OF TOTAL QUALITY MANAGEMENT IN THE CONTEXT OF DIGITAL TRANSFORMATION ON CORPORATE SUSTAINABILITY

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## 1) IINTRODUCTION

Organizations are frequently obliged to produce novel items for a competitive marketplace in this era of rapid technological innovation. enterprises significantly contribute to the worldwide expansion of the global economy and creative output, but they confront specific hurdles to producing new goods. enterprises are more capable of adapting, demonstrating their advanced adaptability to advancements in technologies, higher-income distribution, and promotion, and indicating that they improve decision making. As marketplaces have become more competitive, small and medium-sized enterprises have attempted to establish themselves through innovative product advancements to compete with major corporations in order to maintain a form of sustainability. As a result, innovation plays a critical role in acquiring competitive strength as it is focused on unique items, innovative marketing and management strategies, and real technology (Anifowose et al., 2022).

Total quality management has been highlighted as a tool that may help businesses in a variety of sectors cope with the marketplace's fast transformation. Escrig-Tena acknowledged total quality management as a globally advanced strategy for attaining quality goods and services that results in operational performance excellence. Recently, total quality management implementation seems to have had a substantial impact on businesses' effectiveness, "Total quality management" is a business management philosophy that emphasizes customer satisfaction and the organization's overall performance by ensuring that customers'

expectations are met. Consequently, firms have used total quality management to boost corporate performance by distinguishing their goods and obtaining a competitive market position(Khurshid et al., 2018).

In recent years, sustainability through digital transformation (DX) has emerged as a critical focus for enterprises. This strategic combination of sustainability and technology adoption holds immense potential for driving positive environmental and social impact while ensuring the long-term viability. DX enables enterprises to integrate sustainable practices into their operations, fostering resource efficiency and minimizing their ecological footprint. By leveraging technologies like data analytics, the Internet of Things (IoT), and cloud computing, MSMEs can optimize energy consumption, minimize waste, and make informed decisions that support sustainable manufacturing processes(Martínez-Peláez et al., 2023).

This research will provide valuable insights into companies implementing Total Quality Management (TQM) in the context of digital transformation to achieve business sustainability.

## 2) Research Problem

The manufacturing business generates a lot of waste, pollutes the environment and consumes more natural resources than ever. Manufacturing companies face several challenges regarding scarce resources, human health, greater environmental customer awareness, stakeholderexpectations and social accountability (Li et al., 2018). For example, the difficulty would be determining long-term sustainability and competitiveadvantage without affecting the natural environment or society and maintaining production volume. Sustainability is an essential key to their potential to overcome such challenges. Corporate sustainability (CS) is primarily determined by three pillars:economic, environmental and social, collectively known as the triple bottom line (TBL)(Goyal et al., 2019).

Total quality management (TQM) is one component that aids an organization's integration of TBL sustainability. TQM is a management philosophy that attempts to meet customer expectations at all system levels using tools, processes, values and performance improvement. TQM is one of the elements that could assist firms in improving their environmental performance. TQM plays a central role in enhancing the company's capability to achieve sustainable development (SD). It helps an organization attain competitive

advantages. Also, it provides superior-quality products at the lowest cost and minimizes waste through efficient resource utilization(Zwain et al., 2017).

In this highly competitive market, businesses, especially manufacturing sectors, must be more resilient to change and thrive long-term. During the last two decades, the manufacturing industry started facing increasing demand for high-quality products (Abbas, 2020). At the same time, increased production activities will harm the natural environment. The manufacturing industry is one of the main milestones in the strength of the economy of any nation. However, they are responsible for large amounts of waste and pollution, consuming more energy and natural resources than ever before (Shahzad et al., 2019). All societies and organizations must adopt new approaches and changes to follow environmental-friendly practices and new strategies and become more socially responsible (Morioka and Carvalho, 2016). Moreover, it is preferred to integrate multiple strategies simultaneously to achieve SD goals effectively (Abbas, 2019). This research will provide valuable insight to manufacturing firms to achieve SD through integrating TQM and CSR.

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From the above, the research problem can be formulated in the following main question: "**What is the impact of total quality management in the context of digital transformation on corporate sustainability?"**

### 3) Previous Studies

Study (SofiAkhmatova et al., 2022) This article is to explore the digital concepts relevant for TQM and identify possible challenges emerging while implementing these concepts in practice. In line with this, this article integrates three stages, thus filling in gaps in the existing research. First of all, it tracks the transition from the concept of quality control to

digital-friendly TQM, highlighting the meaning of quality, specific features of TQM development, and breakthroughs in the history of TQM. It is noted that the contemporary TQM represents quality as a category open to the achievements of scientific and technological progress that can assist in meeting the customers' expectations and attaining competitiveness. Second, the article analyzes the TQM in the context of the fourth industrial revolution.

Study (Anifowose et al., 2022) focuses on investigating the role of innovation speed in mediating the relationship between total quality management and small and medium-sized enterprise performance. Cross-sectional data from 484 Nigerian small and medium-sized manufacturing enterprises were collected using judgmental sampling, which was targeted at the owners and managers of small-scale manufacturing enterprises within Nigeria. The obtained data were evaluated using both descriptive and inferential statistical techniques. Hence, the heuristic model for the relationship was subjected to a string of tests using the partial least squares structural equation modeling technique. The results show that total quality management is positively related to operational performance as well as innovation speed, which has a substantial influence on the nexus between total quality management (TQM) and small and medium-sized enterprises' (SME) performance. The study expands the understanding of innovation, regarding speed and its measures within total quality management, where the five basic dimensions of total quality management are top management quality practices, employee quality management, customer orientation, process management, and employee knowledge and training. Furthermore, the model contributes to the scarce literature on the mediating factors needed to boost the operational performance of small-scale manufacturing firms.

Study(Hassis et al., 2023) This study aims at investigating the impact of total quality management (TQM) on corporate sustainability (CS) by mediating the role of corporate social responsibility (CSR) in developing countries, The findings demonstrate that customer focus and human resource management (HRM) were the most effective practices. Structural analysis revealed that TQM had a significant impact on CSR and CS. Furthermore, CSR partially mediates the relationship between TQM and CS.

Study (Su and Wu, 2024)this study examines the relationship between enterprise digital transformation and enterprise sustainable development, as well as the mediating role of enterprise core competence between the two. The study shows that enterprise digital

transformation has a significant and positive impact on enterprise innovation capability, indirectly contributing to the sustainable development of enterprises. These conclusions remain valid after the robustness test. The study expands the perspective of enterprise sustainable development research and provides useful reference for promoting China's enterprises to achieve sustainable development under the economic "new normal.

**By reviewing previous studies**, the research concludes that the total quality management of digital transformation techniques to achieve companies sustaining leads to continuous improvements within business organizations, and works to improve efficiency, accuracy and ability to adapt, and contribute to monitoring the actual time of production operations.

### 4) The Objective Research

The researcher from the field study aims to identify the views of the study sample on the impact of total quality management in light of digital transformation on the sustainability of companies.

### Research Hypotheses

In light of the objective of the study, the researcher can test the following research hypotheses.

- **The first hypothesis ($H0_1$):**"There is no moral impact between total quality management in light of digital transformation and the economic dimension of corporate sustainability".
- **The second hypothesis($H0_2$)** "There is no significant impact between total quality management in light of digital transformation and the environmental dimension of corporate sustainability".
- **The third hypothesis($H0_3$)** "There is no significant impact between total quality management in light of digital transformation and the social dimension of corporate sustainability".

### 5) The Importance of Research

The importance of the research follows from the scientific and practical contributions that it will add, and in its fact that it sheds light on how to enhance the performance of business organizations by integrating the method of comprehensive quality with digital transformation techniques, in a world characterized by rapid changes and increased competitive pressures, as the application of total quality management is a vital performance to measure performance from multiple increase, including focus on customers, participation and continuous,

systematic, systematic based on Data, leadership, relationships, suppliers, training and development, and understanding how to exploit digital technologies to improve the dimensions of total quality management can contribute to achieving the sustainability of organizations, by enhancing efficiency, innovation, and the ability to adapt to environmental changes.

## 6) Theoretical framework

### (A) Total Quality Management

Total quality management also refers to a company's management and workers' ongoing efforts to maintain long-term customer satisfaction and loyalty. Total quality management practically guarantees that everyone tries to enhance work culture, procedures, services, and systems for long-term success to be achieved(Singh et al., 2018).

Total quality management was initially used mostly in the manufacturing industry, and later it became known as one of the most essential criteria for gaining a competitive advantage in the service and other sectors (Akhmatova et al., 2022).

Total Quality Management (TQM), according to, is a good way to improve performance no matter where an organization works, as long as the processes of total quality management are used correctly(Akhmatova et al., 2024).

**The importance of total quality management: (Hassis et al., 2023)**

- Organizations seek customer satisfaction by delivering high-quality products at competitive prices.
- TQM focuses on continuous improvement, improving overall organizational productivity.
- TQM enables companies to integrate all their functions at all levels, which enhances productivity and financial performance.

It is represented concepts of TQM. This research considers the six criteria as TQM model elements: leadership, strategic planning, customer and market focus, process management, human resource management (HRM) and information and analysis.

### (B) Corporate sustainability

The concept of sustainability is increasingly being applied by many organizations worldwide. Meanwhile, CS has more suitable and applicable measurements for sustainability in manufacturing and business (Morioka and Carvalho, 2016).

Concept Corporate Sustainability is a business approach that creates long-term value by integrating environmental, social, and governance (ESG) considerations into a company's operations and decision-making processes. It focuses on meeting the needs of present stakeholders (including shareholders, employees, customers, and communities) without compromising the ability of future generations to meet their own needs(Kannan, 2018).

Moreover, firms are facing pressure to become greener; this implies that their activities do not hurt the natural environment. Effective implementation of CS cannot be achieved by considering TBL's environmental and economic pillars. Besides those two pillars, it is vital to consider the social dimension in decision-making. Till now, social sustainability has received little attention compared to environmental and economic sustainability, especially in emerging economies (Vafadarnikjoo et al., 2020).

**(C) The relationship betweenTotal Quality Management in the Context of Digital Transformation on Corporate Sustainability**

A study by Javaid Butt (2020) indicated that Total Quality Management (TQM) is gaining increasing importance in the business model based on digital transformation, as it contributes to enhancing the effectiveness of modern technology applications such as the Internet of Things, robotics, big data, and artificial intelligence, which impacts the functions of individuals. By integrating TQM principles with digital transformation, organizations can improve operations and achieve excellence in performance, which contributes to reducing errors and increasing customer satisfaction. These digital applications help collect and analyze data more accurately, enabling informed decisions to be made that enhance operational efficiency and achieve business sustainability.

Narahari et al. (2023) argues that the relevance of TQM in light of digital transformation to corporate sustainability is demonstrated by its reciprocal impact on business model change. Quality management contributes to enhancing processes and achieving efficiency, while digital transformation provides innovative tools and technologies that restructure these processes. When organizations embrace digital transformation, they enable improvements such as process automation and effective data collection, which enhances TQM's ability to measure performance and analyze customer satisfaction more accurately. In this way, the business model becomes more flexible and responsive to changes in the market, which contributes to achieving a balance between quality and innovation and enhances the organization's competitiveness in the evolving business environment.

Integrating the dimensions of Total Quality Management (TQM) into digital transformation technologies and digital industries leads to continuous improvements within business organizations. Cloud computing improves efficiency, accuracy, and adaptability. The Internet of Things (IoT) contributes to real-time monitoring of production processes. Robotics technology helps predict and mitigate potential problems. Furthermore, data-driven TQM systems are being created, impacting the development of individual functions within the organization and effectively meeting customer needs.

## 7) Field Study

### Study population

The study population identified by the researcher consists of Quality Management and Digital Transformation staff, senior management, and faculty members.

### Managing the survey list

The researcher managed and implemented the survey list through electronic distribution and personal distribution, and it was distributed to (350) survey lists on a group of the study population, based on their different job levels, and the response rate was (84%) equivalent to (293) list, and this is evident through the following table.

**Table 1: Survey lists distributed among sample categories.**

| Sample | Distributed Lists | Missing Lists | Received Lists | Rejected Lists | Analyzed Lists | Responses ... |
|---|---|---|---|---|---|---|
| Survey Questionnaire | 350 | 27 | 323 | 30 | 293 | 84 |

### Statistical Analysis of Assumptions

- **Descriptive analysis**

**1- Descriptive analysis of the independent variable (total quality management under digital transformation)**

The researcher reviews the results of the characterization of opinions on the questions associated with the independent variable.

**Table (2): Descriptive Statistics of Total Quality Management in Light of Digital Transformation.**

| Paragraphs | | mean | Standard deviation | Order of importance |
|---|---|---|---|---|
| 1 | Digital transformation contributes to accelerating process execution and improving operational efficiency. | 4.06 | 0.911 | 5 |
| 2 | Digital transformation techniques reduce errors and improve the quality of products or services. | 4.29 | 0.904 | 4 |
| 3 | Digital technology provides effective tools for monitoring performance and quality indicators. | 4.48 | 0.654 | 3 |
| 4 | Digital quality management fosters a culture of continuous improvement within an organization. | 4.58 | 0.617 | 2 |
| 5 | Digital transformation helps respond quickly to customer needs and market changes. | 4.66 | 0.360 | 1 |
| Total | | 4.41 | 0.744 | — |

**Outputs (SPSS)**

It is clear from the previous table that the average of all phrases is greater than (3), and this indicates that there is a general trend towards approval of "**total quality management in light of digital transformation"**, with an arithmetic average of (4.41). It is also noted that the standard deviation of all phrases is less than one, and this indicates a decrease in dispersion in the sample responses to these phrases.

**2- Descriptive analysis of the dependent variable (corporate sustainability)**

The researcher will present the results of the characterization of opinions on the questions associated with the dependent variable.

**Table 3: Special descriptive statistics of the dimensions of corporate sustainability.**

| Paragraphs | | mean | Standard deviation | Order of importance |
|---|---|---|---|---|
| **Economic Dimension of Sustainability** | | | | |
| **1** | **Improving resource efficiency within the company** | **4.57** | **.762** | **3** |
| **2** | **Reduce operational costs** | **4.60** | **0.569** | **2** |
| **3** | **Productivity increases** | **4.23** | **0.809** | **4** |
| **4** | **Enhancing the company's competitiveness in the market** | **4.69** | **0.565** | **1** |
| **Environmental Dimension of Sustainability** | | | | |
| **1** | **Reduce Industrial Waste and Waste** | **4.70** | **0.478** | **2** |
| **2** | **Monitor their environmental emissions and improve their environmental performance** | **4.73** | **0.482** | **1** |
| **3** | **Rationalization of energy consumption** | **4.22** | **0.552** | **3** |
| **Social Dimension of Sustainability** | | | | |

| | | | | |
|---|---|---|---|---|
| **1** | **Customer satisfaction and responsiveness to services.** | **4.27** | **0.571** | **3** |
| **2** | **Staff training and development.** | **468** | **0.524** | **1** |
| **3** | **Promote corporate social responsibility by improving social performance** | **4.60** | **0.578** | **2** |
| **Total** | | **4.53** | **0.589** | **——** |

**Outputs (SPSS)**

It is clear from the previous table that the average of all phrases is greater than (3), and this indicates that there is a general trend towards approving the dimensions of sustainability (economic– environmental – social), with an arithmetic average of (4.53). It is also noted that the standard deviation of all phrases is less than one, and this indicates a decrease in dispersion in the sample responses to these phrases.

**← Hypothesis test**

**First Hypothesis Test**

The validity of the first hypothesis **(H0 $_1$) is tested,** which is "**There is no significant impact between TQM under digital transformation and the economic dimension** of **corporate sustainability"**

The correlation matrix has been applied to measure the correlation between the two variables, as shown in the following table.

**Table No. (4) Pearson correlation matrix to identify the extent to which there is a correlation between total quality management in light of digital transformation on the economic dimension of corporate sustainability.**

| Independent variable | Correlation coefficient (Pearson) | Sig |
|---|---|---|
| Total Quality Management in Light of Digital Transformation | 0.724** | 0.000 |

***A function at a significant level less than (0.05)**

**Source: SPSS Output Outcomes**

It is clear from the previous table that there is a positive (direct) significant correlation between the independent variable and the dependent variable, as the correlation coefficient reached (0.724**) at a significance level of less than (0.05), and therefore the nihilistic hypothesis is rejected and the alternative hypothesis is accepted, "**There is a significant correlation between total quality management in light of digital transformation and the economic dimension** of **corporate sustainability."**

As a result of the relationship between the independent variable and the dependent, the simple linear regression model can be applied.

**Table No. (5): Using the Simple Step Regression Model to Determine the Impact of Total Quality Management in Light of Digital Transformation on the Economic Dimension of Corporate Sustainability.**

| Independent Variables | (B) | T. Test | | F. Test | | $R^2$ |
|---|---|---|---|---|---|---|
| | | Value | sig | Value | sig | |
| Constant | 1.292 | 6.651 | 0.000 | 273.736 | 0.000 | 52% |
| Total Quality Management in the Age of Digital Transformation | 0.718 | 16.545 | 0.000 | | | |

*A function at a significant level less than (0.05)

**Source: SPSS Output Outcomes**

- **It is clear from the previous table that**

- **Determination coefficient:** Which indicates that the independent variable explains (52%) of the dependent variable "the **economic dimension** of the **company's sustainability**", and the rest (48%) may be due to the random error in the equation or perhaps not to include other independent variables that were supposed to be included in the model.
- **Testing the significance of the quality of matching the regression model:** To test the significance of the variables of the model as a whole, the (F Test) was used, as the value of the (F Test) is (273.736), which is significant at a level of less than (0.05), which indicates the impact of the independent variable on the dependent variable.
- **Testing the significance of the independent variable:** Using the T Test, it is clear that the independent variable in the simple linear regression model of **total quality management under digital transformation** has a significant impact at a significance level of (0.05).

$$Y = 1.292 + 0.718\,X$$

- **Form Equation**

From the above, we accept the alternative hypothesis and impose the null hypothesis "**There is a moral impact between total quality management in light of digital transformation and the economic dimension** of **corporate sustainability**"

**← Testing the second hypothesis**

The validity of the second hypothesis**($H0_2$),** which is "**There is no significant impact between TQM under digital transformation** and the **environmental dimension of corporate sustainability",** is tested as follows**:**

The correlation matrix has been applied to measure the correlation between the two variables, as shown in the following table.

**Table No. 6: Pearson correlation matrix to identify the extent to which there is a correlation between total quality management in light of digital transformation on the environmental dimension of corporate sustainability.**

| Independent variable | Correlation coefficient (Pearson) | Sig |
|---|---|---|
| **Total Quality Management in Light of Digital Transformation** | **0.778**** | **0.000** |

***A function at a significant level less than (0.05)**

**Source:** SPSS Output Outcomes

It is clear from the previous table that there is a positive (direct) significant correlation between the independent variable and the dependent variable, as the correlation coefficient reached (0.778**) at a significance level of less than (0.05), and therefore the null hypothesis is rejected and the alternative hypothesis is accepted, "**There is a significant correlation between total quality management in light of digital transformation** and the **environmental dimension of corporate sustainability."**

As a result of the relationship between the independent variable and the dependent, the simple linear regression model can be applied.

**Table No. 7: Using the Simple Step Regression Model to Determine the Impact of Total Quality Management in Light of Digital Transformation on the Environmental Dimension of Corporate Sustainability.**

| Independent Variables | (B) | T. Test | | F. Test | | $R^2$ |
|---|---|---|---|---|---|---|
| | | Value | sig | Value | sig | |
| Constant | 0.602 | 3.083 | 0.000 | 382.252 | 0.000 | 60% |
| Total Quality Management in the Age of Digital Transformation | 0.856 | 09.155 | 0.000 | | | |

***A function at a significant level less than (0.05)**

**Source: SPSS Output Outcomes**

- **It is clear from the previous table that**

- **Determination coefficient:** Which indicates that the independent variable explains (60%) of the dependent variable "the **environmentaldimension** of **corporate sustainability"**, and the rest (40%) may be due to random error in the equation or perhaps not to include other independent variables that were supposed to be included in the model.
- **Testing the significance of the quality of matching the regression model:** To test the significance of the variables of the model as a whole, the (F Test) was used, as the value of the (F Test) is (382.258), which is significant at a level less than (0.05), which indicates the impact of the independent variable on the dependent variable.
- **Testing the significance of the independent variable:** Using the T Test, it is clear that the independent variable in the simple linear regression model of **total quality management under digital transformation** has a significant impact at a significance level of (0.05).

$$\rightarrow \boxed{Y = 0.602 + 0.856\ X}$$

- **Form Equation**

From the above, we accept the alternative hypothesis and impose the null hypothesis "**There is a moral impact between total quality management in light of digital transformation** and the **environmental dimension of corporate sustainability**."

**← Hypothesis Test 3**

The validity of the third hypothesis**($H0_3$),** which is "There is **no significant impact between TQM under digital transformation and the social dimension of corporate sustainability of the company", is tested.**

This has been used the method of simple linear regression analysis, in order to measure the impact of the relationship between the two variables, through the application of the correlation matrix, and this is evident through the following table.

**Table No. 10: Pearson correlation matrix to identify the extent to which there is a correlation between total quality management in light of digital transformation on the social dimension of corporate sustainability.**

| Independent variable | Correlation coefficient (Pearson) | Sig |
|---|---|---|
| Total Quality Management in Light of Digital Transformation | 0.714** | 0.000 |

***A function at a significant level less than (0.05)**

**Source: SPSS Output Outcomes**

It is clear from the previous table that there is a positive (direct) significant correlation between the independent variable and the dependent variable, as the correlation coefficient reached (0.714) at a significance level of less than (0.05), and therefore the null hypothesis is rejected and the alternative hypothesis is accepted, "**There is a significant correlation between total quality management in light of the digital transformation and the economic dimension of the company."**

As a result of the relationship between the independent variable and the dependent, the simple linear regression model can be applied.

**Table No. 11: Using the Simple Step Regression Model to Determine the Impact of Total Quality Management in Light of Digital Transformation on the Social Dimension of Corporate Sustainability.**

| Independent Variables | (B) | T. Test | | F. Test | | $R^2$ |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Constant** | 0.972 | 4.459 | 0.000 | 260.136 | 0.000 | 51% |
| **Total Quality Management in the Age of Digital Transformation** | 0.782 | 16.129 | 0.000 | | | |

*A function at a significant level less than (0.05)

**Source: SPSS Output Outcomes**

- **It is clear from the previous table that**
- **Determination coefficient:** Which indicates that the independent variable explains (51%) of the dependent variable "the social **dimension** of **corporate sustainability"**, and the rest (49%) may be due to random error in the equation or perhaps for not including other independent variables that were supposed to be included in the model.
- **Testing the quality of matching the regression model:** To test the significance of the variables of the model as a whole, the (F Test) was used, as the value of the (F Test) is (260.136), which is significant at a level less than (0.05), which indicates the impact of the independent variable on the dependent variable.
- **Testing the significance of the independent variable:** Using the T Test, it is clear that the independent variable in the simple linear regression model of **total quality management under digital transformation** has a significant impact at a significance level of (0.05).

$$\rightarrow \boxed{Y = 0.972 + 0.782\ X}$$

- **Form Equation**

From the above, we accept the alternative hypothesis and impose the null hypothesis "**There is a moral impact between total quality management in light of the digital transformation and the economic dimension of the company**"

**Findings, recommendations and future proposals**

**First: The results of the study**

- There is a significant impact between total quality management in light of digital transformation and the economic dimension of corporate sustainability, as it contributes to improving the efficiency of operations, reducing waste, and enhancing productivity, which reflects positively on the economic performance of companies, and helps them achieve long-term economic sustainability.
- There is a significant impact between total quality management in light of digital transformation and the environmental dimension of corporate sustainability, by reducing waste and emissions, enhancing resource efficiency, and adopting environmentally friendly production practices, which supports the achievement of the environmental dimension of sustainability.
- There is a moral impact between total quality management in light of digital transformation and the social dimension of corporate sustainability, by improving the work environment and increasing employee satisfaction, which consolidates its social role and enhances its stability and sustainability.

**Second: Recommendations for the study**

- Review and develop quality policies in line with the requirements of digital transformation and environmental, social and economic challenges.
- Invest in digital infrastructure to facilitate the effective and efficient application of total quality tools.
- Employing modern technologies such as artificial intelligence, blockchain, and the Internet of Things to support sustainable decision-making.
- Training human cadres on the use of digital systems associated with total quality and data analysis.

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