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**Artificial Intelligence: Between Scientific Innovation and Human Responsibility**

# The role of artificial intelligence in developing management accounting reports to achieve sustainable performance

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**Abstract**
This study aimed to demonstrate the extent to which artificial intelligence (AI) contributes to the development of management accounting reports for achieving sustainable performance within economic units. Many economic units face weaknesses in utilizing accounting reports in a way that supports data-driven decision-making. AI emerges as a tool capable of enhancing the quality of these reports by improving accuracy, speed, and analytical and predictive capabilities. The study measures the impact of using these reports on strengthening the economic, environmental, and social dimensions of sustainable performance. The expected results indicate that adopting AI in preparing management accounting reports enhances decision-making efficiency and supports the achievement of better sustainable performance within the economic unit.

**Keywords:** Artificial Intelligence, Management Accounting Reports, Sustainable performance

## Introduction

With the continuous acceleration of economic and technological changes globally, the challenges facing the modern economic unit are increasing, particularly in its ability to balance financial efficiency with social responsibility and environmental protection. In this context, the concept of sustainable performance has emerged as a fundamental criterion for evaluating the success of the economic unit .This concept reflects the importance of achieving the unit's economic objectives while considering environmental and social aspects, thus ensuring its continuity and long-term stability. In other words, sustainable performance has become a central focus that enhances the economic unit's ability to face challenges and achieve excellence.

On the other hand, the function of management accounting has undergone a significant transformation from being a traditional tool for providing financial information that supports operational decisions to a strategic role that guides management towards achieving integrated efficiency and sustainability. Consequently, it has become essential for management accountants to adapt to these developments by developing reports and performance indicators that consider financial aspects in addition to environmental and social dimensions.

This study aims to examine and analyze accounting reports, focusing on how these reports contribute to improving the quality of management decisions. The study is divided into the following sections:

First Axis: Study Methodology
Second Axis: Integrating Artificial Intelligence into Management Accounting
Third Axis: Sustainable Performance
Fourth Axis: The Practical Aspect of the Study

**The first axis: Methodology of the study**

1. The problem addressed in the study: A significant disparity is observed in the level of application of artificial intelligence (AI) technologies, despite continuous developments in economic units. This disparity is evident in the degree of adoption, the quality of resulting reports, and their actual impact on enhancing sustainable performance. This raises questions about the true efficiency of these reports and the readiness of the organizational and technological environment within the economic unit to effectively adopt these tools. Therefore, the main problem of the study is defined as the weak utilization of AI to support accounting reports in achieving sustainable performance. This raises questions about the efficiency and effectiveness of these reports in promoting the economic, social, and environmental aspects of sustainable performance within the economic unit. This main problem gives rise to a set of sub-questions, most notably:

1. To what extent are AI technologies adopted in preparing management accounting reports?
2. What is the nature of the information provided by these reports with regard to the concept of sustainability?

**Study Objectives**

This study aims to

1. Explore the extent to which artificial intelligence (AI) techniques are used in preparing management accounting reports within economic units.
2. Study the impact of AI-enhanced management accounting reports on improving the quality of information related to sustainability.
3. Evaluate the role of these reports in supporting decision-making processes to serve sustainable performance in its economic, environmental, and social aspects.
4. The Importance of the Study:

This study contributes to bridging the existing knowledge gap between management accounting and artificial intelligence technologies, focusing on clarifying the mechanisms through which these two fields can be integrated to achieve sustainability goals.

Furthermore, the study's findings help decision-makers within economic units improve the quality of their management reports, making them more accurate and relevant to sustainable performance.

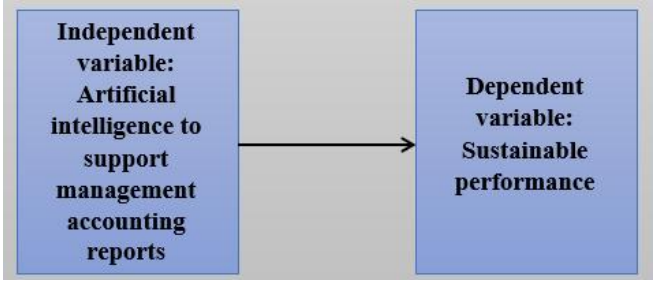
**Study Hypotheses**

Employing AI-enhanced management accounting reports is a pivotal factor in enhancing the economic performance of the economic unit.

- It is clear that employing AI-enhanced management accounting reports yields positive benefits, particularly regarding the economic unit's compliance with environmental standards.
- Despite the potential benefits, technical and organizational challenges pose an obstacle that may reduce the efficiency of AI-based management accounting reports, negatively impacting their ability to achieve sustainable performance objectives

**Study model**

**The hypothetical study plan was prepared by the researcher**




Second topic: Integrating artificial intelligence into management accounting.

**The concept of artificial intelligence**

Artificial intelligence dates back to the mid-20th century, with the Dartmouth Conference of 1956 organized by a group of scientists including John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon. At this conference, researchers proposed the possibility of designing a machine capable of mimicking any task requiring human intelligence. While there is no universally accepted definition of artificial intelligence, there is broad agreement that machines based on this technology may be able to imitate or even surpass human cognitive abilities, including sensing, language interaction, reasoning, analysis, problem-solving, and even creativity). Educational (07: 2023,

The system is distinguished by its ability to accurately analyze external data, learn from it, and utilize this knowledge to achieve specific goals and tasks through flexible adaptation (Haenlein, 2019:15) [2]

Artificial intelligence is a field within information systems, with deep roots spanning decades of multidisciplinary research, aiming to mimic human capabilities. (Beccalli, Elliot, & Vrili, 2020: 21) [3]

It can be described as a combination of knowledge, machine learning, reasoning, hypothesis formulation and analysis, as well as natural language processing, resulting in insights and analyses related to human capabilities or superiority. (Villar & Khan 2021: 74) [4]

**Objectives of Artificial Intelligence**

Artificial intelligence is a branch of computer science that focuses on designing intelligent systems. An intelligent system is a program capable of understanding its environment and making decisions that enhance its chances of success in performing its tasks or the tasks of its team. This field focuses on the science and engineering of developing intelligent machines.

Artificial intelligence encompasses several aspects, including: (Souriya & Al-Saeed, 2022: 461)

- Understanding the complex mental processes that the human mind performs during thinking, and then converting these processes into their equivalent computational operations, thus enhancing the computer's ability to handle complex problems;
- Studying the nature of human intelligence by developing computer programs that can simulate intelligent human behavior. This means that the program can solve a specific problem or make a decision in a given situation based on a description of that situation. The program determines the appropriate method for solving the problem or making the decision, relying on a variety of inferential processes. This point represents a significant

shift that goes beyond mere information technology, as the inferential process is carried out in a way that resembles human thinking.

**The Impact of Artificial Intelligence (AI) on Management Accounting**

Artificial intelligence has had a profound impact on the field of management accounting, leading to numerous developments and improvements. While some may consider these developments to be merely minor enhancements to management accounting processes resulting from technological advancements, they are technically classified as AI in their essence (Patel, 2023) [6].

The integration of AI technologies in management accounting offers broad prospects for innovation and increased productivity (Duong, 2024) [7]. As the role of the management accountant evolves—becoming a key partner to management within the economic unit, actively contributing to idea generation and value creation—the strategic integration of AI is imperative to achieve and enhance the efficiency of management accounting and adapt to the demands of the modern era.

**The Role of Artificial Intelligence Technology in Supporting and Developing Management Accounting**

The application of artificial intelligence (AI) technology in management accounting offers numerous alternatives and opportunities for management accountants. It effectively contributes to innovation and business process re-engineering. Furthermore, it enhances the use of accounting information through automation and personalization (Varzaru, 2022:2256). In addition, AI technology provides added value to management accountants, such as increased efficiency and productivity, time and cost savings, and improved decision-making (Marquez, 2021) [9]. Moreover, the application of AI has led to a qualitative shift in management technologies, contributing to a 12% acceleration in information flow, a 6% improvement in information accuracy, and the design of intelligent decision support systems (Qiu, 2021:7) [10].

Information analysis using AI technology enables managers to make decisions based on accurate evidence rather than guesswork, thus providing better operational and practical opportunities. It also helps enhance operational efficiency and revenue growth. Furthermore, artificial intelligence technology helps in analyzing data at the level of entire communities rather than a sample system due to the ease of access to external data, which improves prediction accuracy and provides better estimates of resource utilization, costs, and performance. (Nicoleta, 2019: 453-462) [11].

**The Concept of Management Accounting**

Management accounting has multiple definitions due to its comprehensiveness and ability to keep pace with developments. Therefore, its definition refers to the following:

Management accounting is defined as "a branch and profession within accounting whose task is to prepare, present, and interpret financial information to assist managers in decision-making and planning within the organization. This accounting includes the use of various tools and techniques, such as budgeting, cost analysis, and performance measurement, to provide relevant and timely information to support managerial decisions. It is considered a crucial foundation for organizations by helping to identify opportunities for improvement, assess the financial impact of strategies, and provide insights into the overall health of the company." (Schaltegger &Wagner, 2017:18) [12]

The Institute of Management Accountants (IMA) also defines it as "a profession that involves participation in management decision-making, the development of planning and performance management systems, and the provision of expertise in financial reporting and control to assist management in formulating and implementing the organization's strategy." (Lawson, 2016:1) [13].

**The Importance of Management Accounting**

The importance of management accounting techniques in financial reporting can be illustrated through the following points: (Marvis *et al*., 2023:113; Zahida, 2020:4-5)

1- Management Accounting Enhances Data Accuracy: When management accounting collects, analyzes, and presents financial data to management, it contributes to improving the accuracy of the information used in financial reports. This means that the reports become more accurate and reliable, enhancing the confidence of internal and external stakeholders.
2- Improves Reporting Procedures: Management accounting improves financial reporting processes. Thanks to its advanced techniques, it can deliver reports more efficiently and on time. This contributes to meeting timely reporting requirements and reduces the effort and resources needed to prepare these reports.
3- Improves Standard Compliance: Management accounting adheres to precise and analytical accounting standards. When these standards are integrated with financial accounting, better compliance with the company's accounting and reporting standards can be achieved, contributing to reducing legal and regulatory risks.

**Overview of Financial Reports**

Financial reports play a pivotal role in enhancing communication and transparency regarding a company's financial information with stakeholders and the broader financial community. These reports focus on preparing and presenting financial statements that provide a clear view of the organization's performance, financial position, and cash flows. The primary objective of financial reports is to provide accurate, relevant, and timely information that enables stakeholders to make informed decisions regarding the company's financial position and prospects. This information is essential for assessing profitability, liquidity, solvency, and overall financial stability. (Oyadonghan & Umoren, 2016:3) [16]. The main documents for financial reporting are the financial statements that summarize the company's financial performance and position. These statements include key financial statements such as the income statement (profit and loss statement), the balance sheet (or statement of financial position), the statement of cash flows, and the statement of changes in equity. Each statement covers different aspects of the company's finances. External financial reports serve as a means for companies to communicate their financial activities and results to external parties such as regulators, tax authorities, investors, lenders, and business partners. It must comply with accounting and reporting standards to ensure consistency and comparability. On the other hand, internal reporting is used by the company's senior management team

for decision-making purposes. It can be more tailored to their specific informational needs and business objectives. The convergence of financial accounting with management accounting techniques has gained traction for several reasons. Integrated reporting has emerged as a strategy that combines management and financial accounting data to provide a more comprehensive understanding of value creation and sustainability within an organization. This approach recognizes the importance of considering both financial and non-financial performance aspects. (Al-Matari *et al*., 2015:2) [17]

**Third Axis: Sustainable Performance**

**Sustainable Performance**

**First: The Concept of Sustainable Performance**

This concept is multidimensional, as it relates to various stakeholders of companies. It includes economic performance, which focuses primarily on achieving economic growth while maintaining a high level of environmental protection. It also includes social performance, which reflects actual organizational achievements in improving living standards. Furthermore, it encompasses environmental performance, which broadly impacts the use of efficient and sustainable energy resources (Bhattara, 2018:39) [19].

Measuring the performance of an economic unit, whether or not it is sustainability-oriented, is a process that relies on the use of indicators that can be classified as economic, social, and environmental (Marcelo *et al*., 2018:4).

**Second: Definition of Sustainable Performance**

John Elkington defined it as a set of successful programs and plans that work to meet the requirements of all parties that deal with and are affected by the economic unit. (Al-Masoudi & Ali, 2016:199) [20].

Sustainable performance is a set of methods that help an organization achieve its goals by maximizing output and generating profit. (Jean-Jacques, 2011:2).

Sustainable performance is defined as "the ability of an organization to utilize its available capabilities and skills at the individual, group, and economic unit levels to meet the needs and desires of current and future stakeholders, taking into account economic, environmental, and social aspects." (Press, 2014:20).

**Sustainable Performance Objectives**

To ensure the achievement of long-term success objectives, senior management can address sustainability challenges through a deeper understanding of the unit's current situation, via sustainable performance. If economic units achieve long-term success, sustainable performance becomes an effective means of leveraging the unit's capabilities and technological tools, while improving the quality of its products, services, and operational processes, with the aim of achieving its vision and objectives. Sustainable performance helps the economic unit identify the fundamental goals and objectives that must be achieved and contributes to removing any obstacles or barriers that hinder its progress toward achieving those goals. In addition, it can enable it to develop unique guidelines for dealing with crises and disasters. It also enhances management's ability to ensure that employees possess the necessary experience and skills to perform their tasks and ensures the appointment of Each individual in the appropriate position within the business unit, with a commitment to implementing sustainability standards. (Nappi & Rozenfeld 2015:8) [23].

**Sustainable Performance Evaluation Indicators**

Sustainable performance measurement systems are defined as a set of indicators that provide management with the information necessary to control, plan, and implement the environmental, social, and economic activities of the economic unit in the medium and long term (Gonzalez *et al*., 2016: 530) [24].

There should be indicators for each dimension of sustainable development through which measurement is conducted to implement the sustainable performance evaluation process. These indicators clarify how performance is measured and compared to other indicators, as well as how it compares to the standards or measurements that must be met (Coukuyt, 2018: 521) [25]

**There is a set of indicators for economic, environmental, and social performance, including the following**

First: Financial Performance Indicators: A variety of quantitative and qualitative indicators can be used to evaluate economic or financial performance. Financial performance refers to the efficiency with which available financial resources are used to achieve specific financial objectives. These indicators include profitability, growth, activity, loans, and liquidity indicators. These also include the following indicators (Wahiba, 2012:102) [26].

1. Productivity Index: Productivity is a measure used to evaluate the economic performance of different factors of production.
2. Market Share Index: This measure represents the market share of the economic unit compared to its competitors.
3. Customer Satisfaction Index: Because the customer is the ultimate goal of the manufacturing process, the economic unit must strive to satisfy them as one of the pillars of total quality.
4. Value Added Index: This index shows the extent to which each economic unit contributes to achieving national income, which is defined as the total value added created in the country during a specific period.
5. Competitive Advantage Index: This is the ability of the economic unit to operate in one or more ways that its competitors cannot match.

**Second: Social Performance Indicators (Hristov & Chirico 2021:7)**

- Social performance indicators are considered a standard for evaluating the extent to which an economic unit fulfills its social obligations and responsibilities, i.e., assessing the social benefits of its economic activity. According to the economic unit, this covers all costs incurred by the unit on behalf of its employees, excluding their basic salary.
- The Social Performance Index of the Community covers all performance costs of the economic unit's contributions to community service, such as donations and contributions to educational and cultural organizations.
- The Socio-Environmental Performance Index covers the costs incurred by the economic unit to protect the environment, meaning it strives to mitigate the risks posed by its economic activity.

- The costs incurred by the economic unit to improve the quality of its products and develop them to meet the needs of the community.

Third: Environmental Performance Indicators (Wang *et al*., 2021:244)

**Several projects have helped identify environmental performance indicators**

1. Environmental Management Indicators: These indicators refer to the management objectives related to the environmental aspect of the economic unit through the strategic and political vision, as well as the organizational structure of environmental management.
2. Environmental Status Indicators: These include all information and statistics about the local, regional, or international environment, such as the state of the ozone layer, global temperature, etc. Environmental performance indicators are divided into two categories:

**Operational Indicators:** These are indicators related to technical standards and product ownership.

Environmental Impact Indicators: These are indicators that express the unintended impacts resulting from the production processes in the economic unit, with the aim of mitigating negative environmental impacts

**Fourth Axis: - The Practical Aspect of the Study**

**First: Research Methodology**

The research adopted the descriptive-analytical approach, as it is the most suitable for studying the phenomenon under investigation and analyzing its various dimensions in light of practical reality. This approach is based on describing the phenomenon as it exists in its real environment, and then analyzing the relationships between its components to understand its nature and interpret its patterns and trends. Semi-structured interviews were used as the primary data collection tool.

**Second: Research Population and Sample**

The research population consists of the key players in the financial and administrative processes related to the study topic. These include management accountants, financial managers, and sustainability experts working at Dhi Qar Oil Company, which represents the geographical framework of the research. This company is an economic unit that offers realistic opportunities for the application of artificial intelligence in accounting.

As for the time frame, the research period extended between 2023 and 2024, which allowed the researcher to track emerging changes and utilize the most up-to-date data on the ground.

**Third: Interview Analysis**

**Demographic Characteristics of Interviewees**

Based on data collected from a field sample of (30) participants working at Dhi Qar Oil Company, the basic demographic characteristics of the interviewees were identified. This was done to understand the professional and educational background of each participant, which contributes to interpreting their positions and opinions on the study topic. The following is a sample of the interviewees' demographic characteristics.

**Table 1:** Demographic characteristics of the interviewees

| Number | Current Jop | Academic qualification | Academic specialization | Years Of experience |
|---|---|---|---|---|
| 1- | Sustainability expert | Masters | Environmental management | 14 years |
| 2- | Administrative Accountant | Masters | Accounting | 11 years |
| 3- | Financial manager | Bachelors | Accounting | 17 years |
| 4- | Sustainability expert | PhD | Environmental engineering | 19 years |
| 5- | Administrative Accountant | Bachelors | Managerial Accounting | 8 years |

***Source***: Table prepared by the researcher

2 Preparing Interview Questions and Topics

The interview form was carefully prepared to align with the research objectives and questions. It was distributed across five main areas: the use of artificial intelligence in preparing management accounting reports, the impact of these reports on financial and economic performance, their impact on environmental and social performance, organizational and technical challenges and obstacles, and finally, suggestions for improvement and recommendations.

3. Hypothesis Testing:

Hypothesis 1: The use of AI-enhanced management accounting reports contributes to improving the economic performance of the economic unit.

**Table 2:** Results of the statistical analysis of the relationship between the use of AI reports and the improvement in economic performance.

| Analysis | value | Value p | Statistical significance |
|---|---|---|---|
| Correlation coefficient (Spearman) | 0.652 | 0.0001 | Dal at the 0.05 level |
| Simple linear regression analysis | regression coefficient $=0.667$, $R^2 = 0.422$ | 0.0001 | Dal at the 0.05 level |

***Source***: Student preparation based on outputs Spss

Table (2) shows the results of the statistical analysis of the relationship between the level of use of AI-enabled management accounting reports and the degree of improvement in economic performance among the study sample. Spearman's rank correlation coefficient was used to measure the strength and direction of the relationship between the two variables, along with simple linear regression analysis to measure the predictive effect of the independent variable on the dependent variable.

The correlation coefficient (r = 0.652) was a positive value indicating a relatively strong positive relationship between the two variables; that is, the higher the level of AI use in report preparation, the greater the degree of improvement in economic performance. Furthermore, the accompanying p-

value (0.0001) indicates that this relationship is statistically significant at the 0.05 level, thus supporting the first hypothesis.

The regression analysis revealed a regression coefficient of 0.667, meaning that each unit increase in the use of AI reports corresponds to an expected increase of 0.667 units in the degree of economic improvement. The coefficient of determination ($R^2$ = 0.422) indicates that the regression model explains approximately 42.2% of the variance in economic performance, a significant figure in social and administrative studies. Furthermore, the p-value of the regression coefficient (0.0001) indicates a statistically significant effect at the 0.05 level, thus strengthening the model's reliability and supporting the hypothesis.

Second hypothesis: There is a positive effect of using AI-enhanced management accounting reports on the level of environmental commitment of the economic unit.

**Table 3:** Results of the statistical analysis of the relationship between the use of AI reports and the level of commitment to environmental considerations

| Analysis | value | Value p | Statistical significance |
|---|---|---|---|
| Correlation coefficient (Spearman) | 0.804 | 0 | Dal at the 0.05 level |
| Simple linear regression analysis | regression coefficient =0.803, $R^2$ = 0.545 | 0 | Dal at the 0.05 level |

***Source***: Prepared by the student based on SPSS outputs

Table (3) reflects the results of the statistical analysis of the correlation and impact of using AI-enabled management accounting reports on the level of environmental commitment of economic units. Spearman's rank correlation coefficient was used to measure the strength and direction of the relationship between the two variables. The results showed a very strong positive correlation, with a correlation coefficient of 0.804. This high value indicates that increased use of AI technologies in preparing accounting reports is associated with a higher level of environmental commitment. The associated p-value is approximately zero (0.000), indicating high statistical significance at the 0.05 level and confirming that the relationship is not due to chance. Simple linear regression analysis showed a regression coefficient of 0.803, meaning that each unit increase in the level of AI use corresponds to a 0.803 increase in environmental commitment. The coefficient of determination ($R^2$) of 0.545 shows that the model explains approximately 54.5% of the variance in the degree of environmental commitment, a relatively high percentage that reinforces the explanatory power of the model. The p-value associated with the regression analysis (0.000) also confirms the statistical significance of the results. Therefore, these indicators collectively support the hypothesis that the use of AI-enhanced management accounting reports has a positive impact on the level of environmental compliance in economic institutions.

**Third hypothesis: Technical and organizational challenges negatively impact the effectiveness of AI-powered management accounting reports in achieving sustainable performance goals.**

**Table 4:** Results of the statistical analysis of the impact of technical and organizational challenges on the effectiveness of smart accounting reports in supporting sustainability

| Analysis | value | Value p | Statistical significance |
|---|---|---|---|
| Correlation coefficient (Spearman) | -0.628 | 0.001 | Dal at the 0.05 level |
| Simple linear regression analysis | regression coefficient =0.641, $R^2$ = 0. 394 | 0.001 | Dal at the 0.05 level |

Source: Prepared by the student based on SPSS outputs

Table (4) shows a strong inverse relationship between the level of technical and organizational challenges facing the application of artificial intelligence in accounting and the effectiveness of these reports in achieving sustainable performance goals. The Spearman correlation coefficient was -0.628, indicating that higher challenges are associated with lower effectiveness. The corresponding p-value (0.001) showed that the relationship is statistically significant at the 0.05 level, lending this result scientific credibility.

The results of the linear regression analysis showed a regression coefficient of -0.641, reflecting a clear negative impact of challenges on the effectiveness of the reports. The $R^2$ value was approximately 0.394, meaning that the regression model explains about 39.4% of the variance in the level of report effectiveness, a relatively significant percentage. These results underscore the importance of removing or reducing institutional and technical obstacles to improve the effectiveness of artificial intelligence applications in sustainable accounting.

**Research Conclusions**

1. The results showed that the use of AI-powered management accounting reports contributes significantly and statistically to improving the economic performance of the economic unit by enhancing the accuracy of financial data and improving predictive capabilities and strategic decision-making, thus supporting the efficiency of financial performance and reducing risk levels.
2. The study demonstrated a strong positive impact of AI reports on supporting environmental compliance, particularly regarding monitoring energy consumption indicators and reducing emissions. However, this impact remains partial due to the lack of complete integration between AI systems and the environmental accounting architecture.
3. The study showed that organizational and technical challenges have a statistically clear negative impact on the effectiveness of smart accounting reports. These challenges—such as weak digital infrastructure and a lack of system integration—hinder the full utilization of AI capabilities in supporting sustainability.

4. The interviews revealed a deficiency in the level of human qualification for using AI. Many employees rely on unstructured, individual skills, in the absence of sustainable training programs or institutional support plans for the digital transformation of accounting functions.

**Recommendations**

1. Enhance applied training programs for employees in the field of artificial intelligence in accounting, focusing on practical applications relevant to the work environment, to ensure the effective and sustainable use of these tools.
2. Develop the digital infrastructure in accounting units by upgrading traditional systems and integrating them with artificial intelligence tools, ensuring stable technical performance and efficient analytical processing.
3. Expand the scope of artificial intelligence to include the environmental and social dimensions in accounting reports by incorporating measurable sustainability indicators and developing specialized and structured databases in this context.

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