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| RESEARCH ARTICLE

Meta-synthesis Method in the Field of Sustainable Industrial Production Strategies

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| ABSTRACT
In the current landscape, businesses are overwhelmed to integrate environmentally friendly methods into their processes. These changes not only help reduce the negative impacts of industrial operations but also positively affect the overall performance of organizations. Most studies have focused on quantitative analysis, and there is a lack of qualitative research that analyzes the various dimensions of sustainable manufacturing. The focus of this study is to qualitatively examine the research results focused on sustainable manufacturing strategies to identify the indicators plus dimensions of these strategies using meta-synthesis methods. This study employed the meta-synthesis approach to review 33 articles. Before coding, document using the KASP method. Altogether, 228 reference codes were recognized, with 714 codes extracted based on frequency. The social dimension emerged as the most significant, with 82 reference codes and a total frequency of 217 codes. This article shows that sustainable production strategies must simultaneously address financial, societal, plus environmental factors to achieve true resilience. This investigation provides insights into a profound knowledge of the dimensions, plus indicators of sustainable production, and assists researchers and decision-makers in developing and implementing sustainable strategies. Additionally, the engagement of meta-synthesis as a research tool can shape future studies in this area.

| KEYWORDS
Sustainable, Production, Strategy, Industry, KASP, Meta-Synthesis

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1- Introduction

Sustainable production means integrating environmental, economic, and social factors into production processes to achieve long-term sustainability (Hegab et al., 2023), originally introduced at the United Nations Conference on Sustainable Production in 1992 (Basosi, 2020). This approach reduces negative impacts by improving economic performance while protecting the environment and society (Bassetti et al., 2021). Businesses are under significant stress (Messah et al., 2023) to be environmentally and socially responsible based on their performance (Nguyen et al., 2021). Failure to pay attention to these requirements can lead to ecological crises, reduced brand reputation, and legal problems (Ray et al., 2021). This research is significant because it helps companies evaluate and improve their performance by identifying the dimensions and indicators of sustainable production. The relevance of this issue to the universal sustainable development objectives and social and environmental requirements doubles the necessity of conducting such research. It serves as a basis for subsequent studies in this area and helps develop efficient solutions to achieve sustainability in various industries.
Previous research has identified and defined different dimensions of sustainability in the sector of sustainable production (Ogunsanya et al., 2023), including financial, environmental, plus social aspects (Ching et al., 2022). However, these investigations

have often focused on every one of these dimensions separately and have paid less attention to their interdependencies (Torabi et al., 2024). There is a shortage of clarity plus transparency in defining and measuring different dimensions of sustainability, especially the social dimensions (Trevisan et al., 2020). While the economic and environmental dimensions can be clearly defined and measured, the social dimensions still need to be examined and defined more precisely (Owojori et al., 2024). This lack of clarity can lead to serious challenges in implementing sustainability strategies across industries. Companies do not fully understand how they can assess and improve the social impacts of their activities (Shah et al., 2021; Redha et al., 2017).
There is a comprehensive study on sustainable production strategies and sustainability performance evaluation indicators in industrial engineering (Cagno et al., 2019). However, there is a significant research divide in social understanding dimensions and interconnections among them in sustainable manufacturing (Patalas-Maliszewska & Łosyk, 2020). This gap is critical because it is related to the lack of agreement on specific criteria for evaluating the social dimensions of sustainability (Ali et al., 2024). It has implications for industries' ability to implement sustainable initiatives and advance social effectiveness skillfully (Hermundsdottir & Aspelund, 2022). Addressing this research gap is crucial because it justifies the evolution of comprehensive and integrated frameworks that clearly define and measure social dimensions (Torabi et al., 2024). This study aims to introduce sustainable development, sustainable production strategy, and existing models in the theoretical foundations of sustainable production strategies and to identify their dimensions and indicators with a meta-synthesis approach. Using comprehensive synthesis, it identifies and analyzes various dimensions and indicators of sustainable production and helps create a comprehensive and integrated framework for evaluating sustainable production strategies. Emphasizing the social dimension of sustainability helps to fill the gaps in this area, and it has not been considered a fundamental pillar of sustainable production strategies. A new theory has been developed regarding the gaps in the social dimensions of sustainable production, stating that the success of any sustainable strategy requires the integration and interaction of economic, environmental, and social dimensions. This theory suggests that neglecting social dimensions and the lack of specific criteria for evaluating them can lead to the ineffectiveness of sustainable production strategies. Given the increasing global pressures to create sustainable products, industries must seriously address the definition and measurement of social components and consider them as a component of their decision-making processes. This theory emphasizes the importance of creating comprehensive and integrated frameworks that define and measure social dimensions and examine relationships. Therefore, by identifying and strengthening social dimensions, industries can achieve more effective sustainable performance and prevent social and environmental crises. This perspective provides a pathway for establishing sustainable and socially responsible management in production that benefits all stakeholders.

2- Literature review

The concept of sustainable strategy is not specific to a particular person. However, in recent decades, numerous researchers and organizations have helped develop this concept (Radomska, 2015). Koenigsmarck & Geissdoerfer It helps locate and measure parameters related to stability. There are distinct models of sustainable production strategy (Koenigsmarck & Geissdoerfer, 2023), which introduced appropriate indicators to assess the firm's sustainability levels (Mohammad Al-Naghi et al., 2024) and identify further sustainability in the future (Patalas-Maliszewska & Łosyk, 2020). Sutherland et al. (2016) highlight the challenges those sectors face in balancing productivity and social responsibility and emphasize the need to develop sustainable models to improve social conditions (Sutherland et al., 2016). Fechete & Nedelcu. (2019). Administration is one of the key tools to attain the goal of sustainable development, which is rooted in social, economic, and environmental criteria. They introduce models that help organizations assess their performance across different dimensions of sustainability and identify their strengths and weaknesses (Fechete & Nedelcu, 2019). Sala et al. (2015) address the challenges and opportunities in the assessment process and develop a framework that helps assess the interactions between these distinct dimensions and allows organizations to analyze the mutual impacts (Sala et al., 2015). Leary & Walker (2018) describe the different steps involved in conducting meta-analyses and meta-synthesis, including study selection, data collection, and analysis of results. It also points out the challenges and ethical considerations associated with these methods and emphasizes the importance of rigor and validity in the research process (Leary & Walker, 2018). Hermundsdottir & Aspelund (2022) This paper analyzes environmental and social innovations as key factors in the evolution of sustainable strategies and shows that these innovations can help increase efficiency, reduce costs, and improve brand image. It uses empirical data to support its claims and examines the effect of these strategies on the fiscal and non-financial performance related to corporations (Hermundsdottir & Aspelund, 2022). Jamal Omidi et al. (2024) emphasize economic dimensions, failing to properly consider environmental and social impacts (Jamal Omidi et al., 2024). Torabi et al. (2024) It has hindered the success of sustainable strategies because, without specific criteria, the results of the assessments are misleading and ultimately make it difficult to identify critical weaknesses and strengths. (Torabi et al., 2024). According to Tariyan et al. (2022), Meta-analysis methods have faced challenges in transparency and validity, which have led to a decrease in the quality of research results (Tariyan et al., 2022).

Research Gap and Novelty

The literature review showed that there has been extensive research on strategies and metrics for evaluating sustainable performance in the field of sustainable manufacturing. However, most studies have focused on quantitative analysis and have paid less attention to qualitative and social dimensions. This gap exists in the literature, especially in identifying and defining the social dimensions of fitness. This item is correct and accurate for the social dimensions of sustainability, where a lack of clarity in defining and measuring social metrics can lead to significant challenges in implementing sustainable strategies. Furthermore, many industries still do not have a thorough grasp of how to assess and improve the social impacts of their activities. This study addresses this gap in the literature and attempts to identify the dimensions and metrics of sustainable manufacturing in a more detailed way using a meta-synthesis approach. By analyzing 33 relevant articles, this research helps clarify the social dimensions of sustainability and explores the interrelationships between economic, social, and environmental dimensions.

3- Methods

The statistical population in this study consists of research articles published on sustainable production from 1996 to 2024 in reputable databases such as Google Scholar and ScienceDirect. The criterion for the sample size in this study is theoretical saturation. That means that upon reviewing more articles, no new indicators or criteria emerge in this area; therefore, the criterion for sample adequacy is theoretical saturation (Al-Ubaydli & McLaughlin, 2017).

In the meta-synthesis method, the sampling of selected samples is non-random. The tool for determining the chosen scientific documents follows the Critical Assessment of Studies Protocol (CASP) method. Therefore, the sampling process in the meta-synthesis begins with articles that have a higher priority according to the CASP methodology and concludes upon reaching theoretical saturation. Data collection is one of the main components of any decision-making process. If they do this task systematically and correctly, we will analyze and interpret the data efficiently and accurately. This study used library and web research tools. Library research is a common approach for identifying and critiquing studies conducted in sustainable production, both domestically and internationally. Using credible scientific resources, such as domestic and international research journals, studying articles, and referring to reputable publications enhances the richness of library research. One of the methods employed for data collection in this study is the library method. In this context, the researcher must consult books, theses, and articles related to sustainable production to examine the research background in this area. By gathering and analyzing the findings of these studies, the researcher aims to reach a scientific conclusion and summary. Web scraping is a tool for accessing the latest data, global statistics, trends, and information from the most recently published scientific articles. Additionally, one of the advantages of web scraping is the up-to-date use of the latest published electronic articles. Notably, with the continuous development of information technology, we are witnessing the publication of a vast and diverse range of materials on sustainable production issues (Torabi et al., 2024).

Therefore, the criterion for this research in selecting materials is to refer to reputable articles and reliable data, as well as the validity and reliability of the research. Validity and reliability are standard terms in research methodology; however, their nature and definitions differ between qualitative and quantitative research. Generally, some researchers believe that in qualitative research, validity and reliability need to be more relevant (Owojori et al., 2024).

However, some others have provided different definitions of validity and reliability. The term validity often refers to the accuracy of the results obtained from a measurement tool. In contrast, reliability pertains to the extent to which the measurement tool can consistently produce results upon repeated testing. In qualitative research, validity refers to credibility, trustworthiness, and confidence in the results. It is important to note that qualitative researchers generally do not claim validity for their tools and findings. In qualitative research methods, the researcher often fails to aim to prove the validity of their results. They used the Kappa coefficient in this study to measure reliability. If this coefficient exceeds 0.6, they consider its value valid and acceptable. One of the methods introduced in recent years for examining, synthesizing, and critiquing past research is a comprehensive study. A comprehensive CA study involves: (A thorough review and evaluation of research findings in a specific area. In recent years, researchers have increasingly mentioned the term meta-analysis. The study is distinct from terms such as meta-analysis, meta-synthesis, meta-theory, and meta-method. A meta-study encompasses all these concepts.

They can view meta-theory as the analysis of theories from past research, meta-method as the analysis of methodologies used in previous studies, meta-synthesis as the qualitative analysis of findings from past research, and meta-analysis as the quantitative analysis of earlier studies (Owojori et al., 2024).

Meta-synthesis examines data and results from further qualitative analyses concerning related themes.

Consequently, we formed the specimen for meta-synthesis from chosen qualitative research grounded in relevance to the study question.

Meta-synthesis is not merely an integrated review of the subject's theoretical foundations or an analysis of secondary and primary data from selected studies; instead, it involves analyzing the findings from these studies (Alhawamdeh & Lee, 2024)

In other words, meta-synthesis combines and interprets the primary data from the selected studies.

4- Results

This paper intends to examine and identify the dimensions and indicators of sustainable production through a meta-synthesis approach to achieve a deeper understanding of the social, financial, plus environmental factors of sustainable production strategies. Conduct a comprehensive review of the study document and integrate the findings of previous reviews. Through this examination, we better represent the dimensions and components inherent in the issue. Therefore, meta-synthesis aids in representing results surpassing any individual previous study. Sandelowski and Barroso (2007) proposed a seven-step process for this purpose.

The first step:

They are setting the research question. The first question to initiate meta-synthesis is what is studied. In the current research, we are questioning the dimensions and indicators of sustainable production strategies. Subsequently, we formulate questions such as who, when, and how.

Second step:

Systematically searched articles published in various scientific journals. They select relevant keywords and continuously reevaluate the definitions of the search terms or the timeframe throughout the research. Ultimately, they conduct online searches to identify the selected studies, downloading a full-text version and a list of references for each article. Then, they review additional selected sources and identify new search terms for further internet searches.

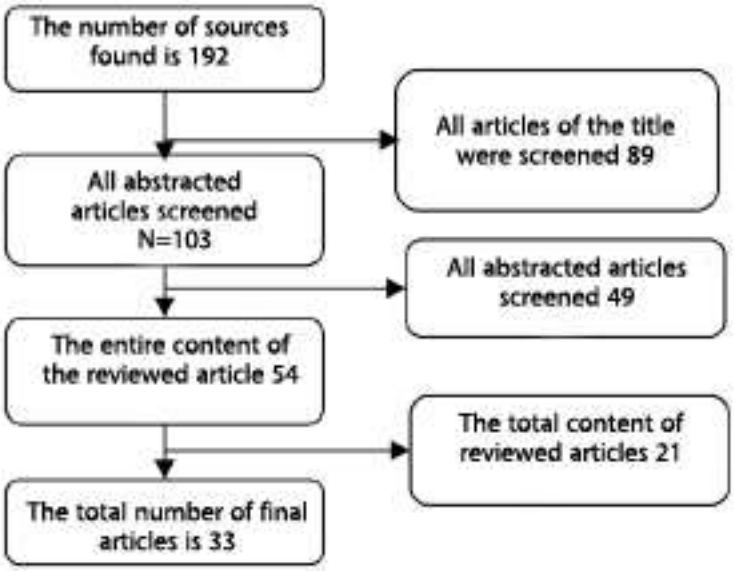


Fig (1). Screening of articles with the KASP tool

Figure 1 illustrates the process of selecting and reviewing articles, detailing the steps taken by the researcher to identify reliable sources. Initially, 192 bibliographic references were reviewed, with 89 articles assessed based on their titles. In the next stage, 103 articles were evaluated based on abstracts, resulting in 49 articles being eligible for review.

The researcher then conducted a complete content review of 54 articles, selecting 21 that addressed specific research needs to ensure their quality and relevance. Ultimately, the total number of final articles was reduced to 33, reflecting the accuracy and rigor in selecting reliable sources.

This careful and systematic process not only demonstrates a commitment to research quality but also prevents the introduction of irrelevant information and positively affects the validity of the results. Thus, the results obtained from these articles can correctly support the research objectives and help increase the final quality of the research. This final selection emphasizes the importance of careful reflection and evaluation in the research process to collect the best and most relevant sources.

Fourth step:

They are extracting the results. After selecting the relevant documents and reports, the next step is to extract codes from the texts. The research questions guiding the extraction of codes are as follows:

- What factors and indicators are involved in sustainable production strategies?
- What are the economic components of sustainable production strategies?
- What are the environmental components of sustainable production?

- What are the social components of sustainable manufacturing?

This study identified 228 reference codes and extracted 714 by considering their frequency.

Fifth step:

Review, analysis, and combination of qualitative findings: We initially considered and organized all extracted factors as codes in the current research. Then, considering each code's meaning, we categorized them into similar themes. This process shapes the concepts of the research themes. The basis for classifying these codes is the degree of similarity among the different codes (tables 1 to 5) present examples of the coding process, with several codes for each theme.

Table (1). Classification of codes into environmental themes and categories

Category	Theme	Code	Abundance	Code
Environmental	Publication of waste	The amount of water lost and purified, the waste produced, the design of a product that can be recycled, unusable ,waste	3	6
	Pollution	Noise pollution, water pollution, global warming, reduction of greenhouse gas production, water electronic waste amount of water used, recycling water) .consumption), land quality	53	15
	Ecosystem maintenance	Waste reduction, ecosystem management (environment), reducing the consumption of scarce environmental resources, Generation of environmentally friendly products, and .government environmental policies	48	11
	Consumable resources	Energy consumption, design of a repurposable product, use of renewable (solar) energy, efficiency, and energy .efficiency	36	6
	Transportation and logistics	Transportation, international transportation, logistics, and choosing .environmentally friendly vehicles	22	6
	Managerial	Management of waste and pollution, attention to technical development, and environmental responsibility of disposal .management	19	8

Table (1) below categorizes the codes into environmental themes and categories, illustrating the different dimensions of environmental challenges. In the Waste Emissions section, code 6 (3 items) refers to issues such as the amount of water lost and treated, waste generated, and the design of recyclable products, which shows the importance of waste management in production and consumption processes. In the Pollution category, code (15) alongside (53 items) addresses noise, water, and global warming pollution, emphasizing the challenges caused by defilement and its influence on the environment and public health. Also, in the Ecosystem Maintenance section, code (11) alongside (48 items) refers to waste reduction and natural resource management, emphasizing the importance of preserving ecosystems. In the Consumable Resources category, code (6) next to (36 items) addresses energy consumption and renewable energies and considers the necessity of designing environmentally friendly products and increasing energy efficiency. In the Transport and Logistics section, code (6) with (22) items refers to the selection of environmentally friendly vehicles and logistics management, which indicates the importance of reducing the negative impacts of transportation on the environment. Also, Management Code 8 (19 items) refers to the administration of waste consumption and pollution and environmental responsibilities, which underscores the need to pay attention to technical and managerial developments in environmental protection. Table (1) shows that ecological challenges require careful attention and management in various dimensions.

Table (2). Classification of codes into themes and economic categories

Category	Theme	Code	Abundance	Code
Economic	Costs	Cost of consumables Cost of employment Reduction of costs Increase of low-cost practices Time Cost of operational equipment Health and safety costs	55	19
	Profitability	Income, profit	10	3
	Investment	Investing in innovation and D&R investing in charities Investing in energy	8	4
	Production performance indicators	Production, checking market and product information and delivery time increasing speed and assets according to quantities and efficiency in processes	20	5

Table (2) below categorizes the codes into economic themes and categories and analyzes various aspects of costs and financial performance. In the Costs section, code 19 (55 items) refers to consumption costs, employment, cost reduction, and low-cost practices, which shows the importance of effective cost management and optimization of financial processes. In the Profitability category, code 3 with 10 items refers to revenue and profit, emphasizing that increasing revenue and profit are key factors in evaluating the economic performance of organizations. The Investment section with codes (4 and 8) items refers to investment in innovation and research and development, which shows the attention of organizations to creating added value and improving performance in the future. Also, in the Production Performance Indicators section, codes 5 and 20 examine market information and speeding up processes, which emphasizes that improving production performance and speeding up service delivery are significant factors in the economic success of organizations. Table (2) reflects the need for effective cost management and targeted investments to increase profitability and improve organizational performance.

Table (3). Classification of codes into themes and social categories

Category	Theme	Code	Abundance	Code
social	Staff	Recordable injuries, blood lead levels, postural disease damage	86	29
	customer	competitive pressure situation, actions, market development, becoming a leader, etc., information required for products and services for procedures	24	7
	Forums	Human resources, description of duties and responsibilities, clarity of position in the field of sustainable growth	79	29
	Local community	Demographic changes, education level, living conditions, social groups, poverty	25	17

Table (3) below categorizes the codes into social themes and categories and analyzes the different dimensions of social impacts. In the Employees section, code (29) with (86) items refers to recordable injuries, blood lead levels, and posture-related injuries. It indicates the importance of employee health and safety in the workplace and highlights the need to emphasize better working conditions. In the Customer category, code 7 with 24 items refers to competitive pressures and conditions and the need for information on products and services, which indicates the effects of the market and competition on business strategies. The Forums section with codes 29 and 79 items refers to human resources and clarity of roles and responsibilities in the framework of sustainable growth that emphasizes the importance of transparency in organizational roles and collaboration in creating sustainable development. Also, in the Local Community section, code (17) alongside (25 items) refers to demographic changes, education levels, and living conditions, which depict social and economic impacts on social groups and poverty. Table (3) shows the importance of paying attention to social dimensions and improving working, competitive, and social conditions to achieve sustainable development.

Table (4). Classification of codes into themes and technology categories

Category	Theme	Code	Abundance	Code
Technology	Research and development	Having an IT system and technical knowledge of processes, products, and services	34	10
	Products from superior technology	Resultant product output from superior technology, technology export, and technology purchase	11	4
	Software	Software updates, security software	8	4

Table (4) below categorizes the codes into technology themes and categories and analyzes the significant impacts of technology on processes and products. In the Research and Development section, (code 10) together with (34 items) refers to the need for IT systems and technical knowledge in processes and products, which indicates the importance of investing in IT infrastructure and updating employee skills to improve operational efficiency. In the High-tech Products category, code 4 with 11 items refers to the output of products resulting from advanced technologies in addition to technology exports and purchases, emphasizing the importance of using new technologies to increase quality and competitiveness in the global market. In addition, in the Software section, codes (4 and 8 items) refer to software updates and security, which showcases the need to maintain cybersecurity and regularly update systems in today's digital world. Overall, Table 4 shows the importance of technology and innovation in improving products and processes and their impact on the success of organizations in competitive markets.

Table (5) .Classification of codes into management themes and categories

Category	Theme	Code	Abundance	Code
managerial	companionship	Feeling conscientious, training supervisors and managers, encouraging teamwork, effective communication with a top-down perspective	41	17
	programs and policies	Governmental laws and regulations for sustainability, top management commitments regarding procedures, control processes, and resources	88	21
	Documentation	Periodic archiving of documents, availability of identification records, and .special conditions	9	5

The table below categorizes the codes into management themes and categories and examines different dimensions of management approaches. In the Companionship section, code 17 (41 items) emphasizes a sense of responsibility, training supervisors and managers, encouraging teamwork, and effective top-down communication, which shows the importance of creating a supportive and collaborative environment to improve organizational performance. In the Programs and Policies category, code (21) alongside (88) items refers to government laws and regulations related to sustainability and top management commitments in the scope **of** processes and resources that emphasize the need to comply with legal requirements and a commitment to sustainability. Also, in the documentation section, code 5 (9 items) refers to the periodic archiving of documents and the availability of identification records, which shows the importance of information management and transparency in organizations. This table underscores the significance of successful management approaches and legal requirements in improving company performance and sustainable development.

The sixth step:

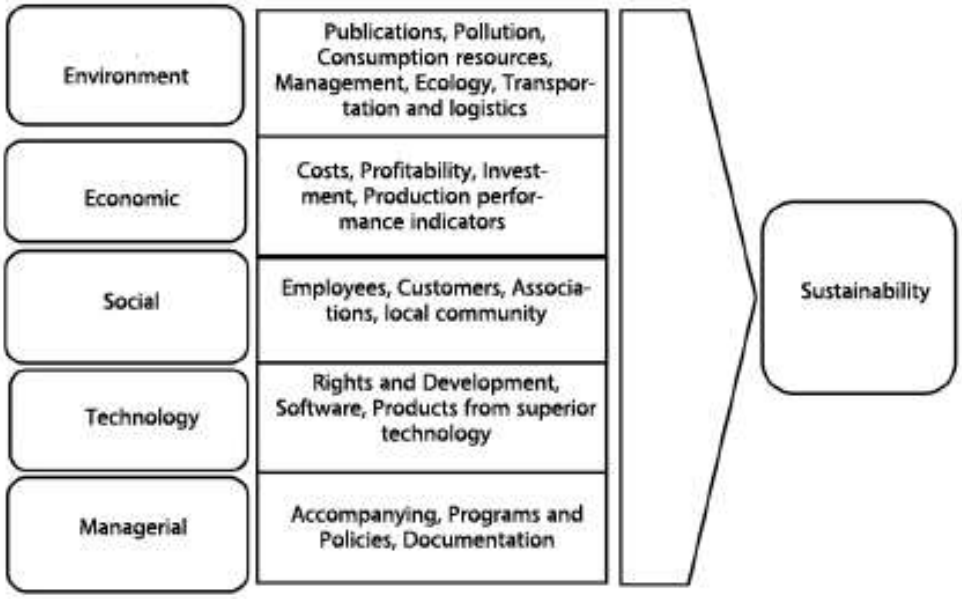
Quality control: In Step Six, we reviewed the results with an expert who assessed them using the Kappa statistic. Table 6 illustrates the agreement between the specialists and the originators' coding regarding one of the texts. We accept this index due to the significance value of 0.000 and the Kappa coefficient of 0.662. It is significant to note that the Kappa coefficient is a criterion for assessing internal reliability. Researchers believe that if this coefficient is above 0.6, it indicates a good level of agreement. Moreover, a significance level of less than 0.05 indicates a relationship in coding between the two examined documents. Table 6 shows the test between the researcher and one of the experts in coding one of the texts. Figure 6 shows the proposed model for a sustainable production strategy.

Table (6). Assessment of alignment between the researcher and an expert in coding one of the texts

Estimated significance (Sig)	Estimate T^b	Deviation of the estimated value	amount	Number of valid observations
0/000	4/439	0/157	0/662	Capt's degree of agreement

Seventh step:

Presentation of findings: In conclusion, we present the results obtained from the meta-synthesis in Figure 2. Figure 2 illustrates the categories along with the themes. As shown in the model, achieving sustainability requires simultaneous attention to all three components: financial, environmental, and societal. More than one or two dimensions will lead to true sustainability.



Fig(2). Proposed model for sustainable production strategy

The research findings illustrate the different dimensions and components of sustainable production by identifying and extracting (714 codes) related to it. Specifically, it deeply analyzes three dimensions: social (29 codes), economic (19 codes), and environmental (15 codes). These codes help develop a new theory, clarifying key components and critical indicators in each dimension and using them as evaluation criteria in sustainable strategies.

Furthermore, by emphasizing 22 themes and 22 different categories across social, economic, and environmental dimensions, the results allow for the design of a comprehensive analytical framework that can assist organizations in identifying and managing the interactions between these dimensions. The ability to identify and select 33 valid articles from the initial set of 192 sources emphasizes the accuracy and reliability of the data used. Therefore, the findings can cause better sustainable production strategies and help organizations achieve sustainability goals in today's complex world.

5- Discussion

A-Interpretation of results

This study's findings emphasize the importance of integrating economic, social, and environmental dimensions into sustainable production strategies. Using a meta-synthesis approach on 33 articles) This research identified a total of 228 reference codes. And 714 codes based on frequency, indicating the multidimensional nature of sustainability. In particular, the social dimension is the most significant dimension identified, which includes 82 reference codes and a total of 217 codes. This importance suggests that social factors, such as employee well-being, community involvement, and stakeholder relations, are crucial for achieving true sustainability. The results emphasize that ignoring any member of this group's dimensions can undermine the effectiveness of sustainability initiatives. Achieved the Sustainable Development Goals without addressing all three dimensions simultaneously. Moreover, the lack of clarity in defining and measuring social dimensions was identified as a significant barrier to efficient implementation, indicating that industries often face challenges in assessing and improving their social impacts. These conclusions contribute to a deeper learning of the indicators plus dimensions associated with sustainable production and provide valuable insights for researchers and decision-makers. This study emphasizes the development of integrated frameworks

that clearly define and measure these dimensions, thus enabling the implementation of more comprehensive and powerful sustainability strategies across industries. The results indicate the need for a comprehensive approach to sustainability in which economic viability, social responsibility, plus environmental protection are considered related and equally important factors.

B- Significance and Implications

The results of this study highlight the importance of integrating economic, social, and environmental dimensions into sustainable production strategies. This research used a meta-synthesis approach of 33 articles. A total of 228 reference codes and 714 codes were identified based on frequency, indicating the multidimensional nature of sustainability. In summary, the social dimension was acknowledged as the most significant aspect, encompassing 82 reference codes and a merged total of 217 codes. This importance suggests that social factors, such as employee well-being, community participation, and stakeholder relations, are crucial for achieving true sustainability. The results emphasize that ignoring any one of the dimensions of the group can undermine the effectiveness of sustainable initiatives and that achieving the Sustainable Development Goals cannot be achieved without addressing all dimensions simultaneously.

Lack of clarity in defining and measuring social dimensions is a known barrier to efficient implementation. Industries often face challenges in assessing and improving their social impacts. These results contribute to a deeper understanding of the indicators and dimensions related to sustainable production and provide valuable information for researchers and decision-makers. This study emphasizes the development of integrated frameworks that clearly define and measure these dimensions, thus enabling the implementation of more comprehensive and efficient sustainability strategies across industries.

The research results demonstrate the need for a comprehensive approach to sustainability in which economic sustainability, social responsibility, and environmental protection are deemed related and equally important factors. This approach can help industries achieve enhanced success in achieving sustainability goals in today's complex world.

C- Limitations and Future Research

While it provides valuable insights into sustainable production strategies, it presents limitations that require discussion. First, the research relies on 33 articles published between 1996 and 2024, which may not fully reflect recent changes and developments in the field. The focus is on qualitative analyses and does not pay sufficient attention to quantitative criteria that are important for assessing sustainability performance. Furthermore, the reviewed articles may have focused on specific geographic regions or industry sectors, which limits the ability to generalize the results. For future research, expanding the scope of the study, integrating quantitative and qualitative measures, and exploring different stakeholder perspectives could help identify more effective solutions. These approaches could help develop more comprehensive frameworks for assessing and implementing sustainable manufacturing strategies and provide a better understanding of the challenges and opportunities in this field.

D- Comparison with previous findings

Our paper addresses the gaps in previous research on sustainable production strategies, using a meta-analytic approach and focusing on social dimensions, such as the work of Krajnc and Glavič (2003). While these studies mainly focus on quantitative models and separate theories, our paper integrates economic, social, and environmental dimensions and emphasizes the need for interaction between these dimensions. It also focuses on transparency and accurate criteria in measuring social dimensions by providing a comprehensive framework for evaluating sustainable production strategies. This qualitative and thorough approach can help improve the efficiency and effectiveness of sustainable strategies in different industries and pave the way for future research.

Our paper addresses several important aspects that distinguish it from the work of Fechete and Nedelcu (2019), especially in the context of sustainable production strategies. While their research focuses on management models that help organizations assess their performance across different sustainability dimensions, our paper qualitatively analyzes these dimensions using a meta-analytic approach. Also, we specifically emphasize the social dimensions of sustainability, which are usually under-researched in the existing literature. Furthermore, we aim to develop a comprehensive framework that assesses and integrates economic, environmental, and social dimensions concurrently. This comprehensive approach and the detailed analysis of gaps in social metrics can contribute to further advances in this field. While Fechete and Nedelcu offer valuable insights into sustainable performance assessment, our paper enhances the understanding of sustainability by focusing on qualitative analysis and incorporating social dimensions, ultimately leading to the evolution of more effective organizational frameworks.

Our Paper addresses more significant aspects of sustainable strategies relative to the work of Hermundsdottir and Aspelund (2022). This paper analyzes environmental and social innovations as key factors in the growth of sustainable tactics and their impact on performance and brand image. We use a meta-analytic approach to explore more broadly the aspects and metrics of sustainable production strategies. Our focus is on the social and economic dimensions related to sustainability, which have received limited discussion in previous works. We also develop a comprehensive framework for evaluating sustainable production strategies that simultaneously considers economic, environmental, and social dimensions. By identifying gaps in social metrics and the need for greater clarity in their measurement, your paper helps to develop more effective strategies for organizations and paves the way for future research.

This consequence is also compatible with the examination by Leary and Walker (2018). Leary and Walker highlight the significance of stringency and validity in examination selection and data research and describe the different stages involved in implementing these methods. They also examine the ethical challenges and considerations associated with these methods and emphasize the need to adhere to standards in the research process. One of the weaknesses of Leary & Walker is that it focuses more on the methodology and implementation steps of these approaches than on an in-depth analysis of the findings and their impacts on specific domains. Our research fills the gap by focusing on the qualitative and social dimensions related to sustainable production methods. This more comprehensive approach allows us to more intimately examine the interactions between different dimensions of sustainability and supply a more serious acuity of the challenges and opportunities in implementing sustainable strategies.

E- Policy Implications

Proposed policies and strategies for achieving sustainable production must address different economic, social, and environmental dimensions. Research shows that neglecting any of these dimensions in a harmful manner affects the effectiveness of sustainable initiatives. For this reason, it is essential to create comprehensive policy frameworks that simultaneously address the three dimensions of sustainability. These frameworks should enable the active participation of different stakeholders, including industries and local communities, and provide companies with the necessary incentives to implement corporate social responsibility (CSR). Also, developing accurate measurement indicators to assess social and environmental impacts and investing in education and awareness-raising about sustainability concepts can help improve industry performance. Finally, supporting innovation and research in green technologies and sustainable processes is one of the key actions that policymakers should take. The implementation of policies moved towards sustainable production and balanced and comprehensive development.

6- Conclusion

This study aims to review the research results from a qualitative perspective focused on sustainable production strategies and identify the indicators and dimensions of these strategies using meta-synthesis methods. The most important results obtained from this analysis stand as follows:

- Sustainable production strategies must simultaneously address economic, social, and environmental extents.
- The social dimension (82 reference codes) and (217 repeated codes) are the most important.
- Lack of clarity in defining and measuring social dimensions can lead to serious challenges in implementing sustainable strategies.
- It is essential to grow comprehensive frameworks for defining and measuring sustainability dimensions.
- Integrating environmentally friendly methods not only helps reduce negative impacts but also improves the overall performance of organizations.

Research indicates that Successful sustainable manufacturing strategies must simultaneously tackle economic, social, and environmental aspects to attain genuine sustainability. The social dimension is a determining factor for success. The field of research in sustainable manufacturing is expanding, and its future requires a focus on developing integrated frameworks, standardizing social indicators, and leveraging technological innovations to improve sustainable processes.

This research contributes to the existing literature by introducing a new theory that underscores the equal relevance and importance of economic, social, and environmental dimensions in sustainable manufacturing. This research shows that neglecting any of these dimensions can undermine the effectiveness of sustainable manufacturing strategies. By filling the gaps in the definition of social dimensions and providing insights into the relationships of these dimensions with economic and environmental factors, this study provides a foundation for research and practice in sustainable manufacturing.

The findings reinforce the importance of developing integrated frameworks and standardizing social indicators, which will be essential for researchers and practitioners of sustainable development in manufacturing processes. The study's implications emphasize that achieving true sustainability requires a holistic approach that recognizes the complexity and interdependence of all dimensions.

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