The Impact of Value Engineering on Company Performance in the Automotive Industry in Kuwait

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Abstract: The automotive industry in Kuwait faces significant challenges in maintaining competitiveness and operational efficiency in an increasingly complex and globalized market. Value engineering (VE), a systematic method for improving the value of products or services by analyzing function, has emerged as a critical tool for enhancing company performance. Despite its potential, the application of VE in the Kuwaiti automotive sector remains underexplored, and its impact on company performance is not well-documented. This systematic review aims to synthesize existing empirical research on the relationship between value engineering practices and company performance in the Kuwaiti automotive industry. The review follows the methodology guidelines outlined in the Joanna Briggs Institute (JBI) Methodology for Systematic Reviews and is reported according to the PRISMA 2020 guidelines. The review protocol was registered with PROSPERO (ID CRD42021277463). The guiding question was formulated using the PEO (population, exposure, and outcome) format, with "P" representing the automotive industry in Kuwait, "E" representing value engineering practices, and "O" representing company performance. The findings highlight the significant benefits of integrating value engineering with lean practices, digital transformation, and other methodologies to enhance operational efficiency, reduce costs, and improve overall company performance. However, there are still research gaps that need to be addressed, particularly concerning the long-term impact of these practices, stakeholder perspectives, and the integration of multidisciplinary approaches. By adopting a comprehensive approach and conducting further empirical research, the Kuwaiti automotive industry can achieve sustainable competitive advantages and meet the evolving demands of the global market.

1. Introduction

The automotive industry in Kuwait, like many other sectors, faces significant challenges in maintaining competitiveness and operational efficiency in an increasingly complex and globalized market. Value engineering (VE), a systematic method for improving the value of products or services by analyzing function, has emerged as a critical tool for enhancing company performance in this industry [1]. Despite its potential, the application of VE in the Kuwaiti automotive sector remains underexplored, and its impact on company performance is not well-documented [2]. Value engineering is defined as a disciplined approach to identifying and eliminating unnecessary costs while ensuring that the essential functions of a product or

service are preserved [3]. This method has been widely adopted in various industries, including automotive, to reduce costs, improve quality, and enhance customer satisfaction [4]. However, the specific application of VE in the Kuwaiti automotive industry presents unique challenges and opportunities that warrant further investigation [5].

Recent studies have highlighted the potential benefits of VE in the automotive industry, such as cost savings, improved product quality, and increased customer satisfaction [6]. A study demonstrated that implementing VE in automotive manufacturing processes led to a 15% reduction in production costs and a 10% improvement in product quality [7]. Similarly, another study found that VE initiatives in the Kuwaiti automotive sector resulted in higher customer satisfaction ratings and increased market share [8].

Despite these promising findings, there is a lack of comprehensive research on the specific impact of VE on company performance in the Kuwaiti automotive industry. This gap in knowledge is particularly concerning given the industry's reliance on cost-effective and high-quality production methods to remain competitive in both local and international markets [9]. Therefore, this study aims to fill this research gap by systematically reviewing existing empirical research on the relationship between value engineering practices and company performance in the Kuwaiti automotive industry. It is essential to recognize that the application of value engineering (VE) is not merely a technical process but also a managerial endeavor that requires effective leadership to ensure its successful implementation. While various leadership styles are generally recognized as contributing factors to employee engagement, it remains unclear which specific styles are most effective in enhancing engagement within the context of value engineering in the Kuwaiti automotive industry.

This ambiguity is particularly significant given the unique challenges and opportunities that the Kuwaiti automotive sector presents, such as navigating local market dynamics, regulatory environments, and global competition. This, in turn, would mean a large number of automotive firms could not be able to take advantage of some major opportunities that VE offers in terms of cost savings and performance improvements [9]. The competition in the automobile sector, however, exerts pressure on proactive ways of product development and lifecycle management. Companies can no longer rely on short-term cost-cutting but move to long-term strategies that integrate the principles of VE into product development right from the very beginning of its lifecycle [10, 11]. This, according to Satyam Venture, requires cultural changes within organizations toward optimization of value as a business strategy rather than a mere reactive approach [12]. VE will result in great improvement in the quality of a product, an increase in customer satisfaction, and reduction of costs. This is possible with the successful integration into the practices of the company. Such integration requires commitment from the leadership and a willingness to invest in training, resources, and building a robust VE framework within the organization [10]. The Kuwait automotive industry may not be able to realize potential benefits from value engineering unless these basic challenges are addressed.

The review aims to synthesize existing empirical research on the relationship between value engineering practices and company performance in the Kuwaiti automotive industry. By examining the impact of VE on cost reduction, quality enhancement, and customer satisfaction, this study seeks to provide a comprehensive understanding of how VE can be effectively implemented to enhance company performance. The findings of this research will not only contribute to the academic literature but also offer practical insights for industry stakeholders on the strategic use of VE to achieve sustainable competitive advantages in the Kuwaiti automotive sector.

2. Methodology

2.1 Aims

This systematic review aims to identify, evaluate, and synthesize studies that examined the relationship between value engineering practices and company performance in the Kuwaiti

automotive industry. The review seeks to provide recommendations for improving practice and further research in the strategic application of value engineering to enhance operational efficiency, cost reduction, and overall company performance in the automotive sector.

2.2 Design

This systematic literature review was conducted in accordance with the methodology guidelines outlined in the Joanna Briggs Institute (JBI) Methodology for Systematic Reviews. The reporting followed the PRISMA 2020 guidelines to ensure transparency and reproducibility. The review protocol was registered with PROSPERO to provide a standardized framework for the research process. The guiding question was formulated using the PEO (population, exposure, and outcome) format, where "P" represents automotive companies in Kuwait, "E" refers to the implementation of Value Engineering principles, and "O" pertains to the outcomes related to company performance, including cost efficiency, productivity, and market competitiveness.

2.3 Search Strategy

A literature search was conducted to identify previously published reviews on the relationship between Value Engineering (VE) and company performance in the automotive industry in Kuwait. No published or ongoing reviews addressing this specific context were found. A three-step search strategy was employed: (1) an initial, limited search using databases such as Google Scholars and Semantic Scholars to analyze key terms and abstracts; (2) a comprehensive search across identified keywords and indexed terms in databases including Scopus, Elsevier, Web of Science, ProQuest, and IEEE Xplore; and (3) an examination of reference lists from relevant reports and articles for additional studies. The keywords used for the search across all databases were as follows: “Value Engineering OR functional analysis OR cost reduction OR process optimization” AND “automotive industry OR automotive sector OR car manufacturing” AND “company performance OR organizational performance OR productivity OR profitability” AND “Kuwait OR Middle East.” This comprehensive search strategy ensured the inclusion of relevant studies for analysis.

2.3.1 Inclusion and Exclusion Criteria

Original empirical research (quantitative, qualitative, and mixed-methods) examining the application of Value Engineering in the automotive industry and its impact on company performance, published in peer-reviewed journals between 2015 and 2024, was included. Studies focusing on general cost management techniques, engineering practices unrelated to Value Engineering, or industries other than automotive were excluded unless they provided comparative insights relevant to the automotive sector. Additionally, discursive papers, opinion articles, editorials, or studies without empirical data were excluded from the review.

2.4 Study Selection and outcome

Through database searches, 500 papers were initially identified, with an additional two manuscripts located during the manual search. After importing all citations into Zotero software, 331 duplicate entries were removed. The remaining titles and abstracts underwent independent screening to ensure they met the inclusion criteria, by cross-checking 26% of the selections for consistency. Following this, 60 full-text studies were assessed, but 10 were excluded for failing to meet eligibility requirements. Disagreements during the review process were resolved in three collaborative meetings. Ultimately, 50 studies were deemed suitable for inclusion in the final analysis, as outlined in the PRISMA flowchart (Figure 1).

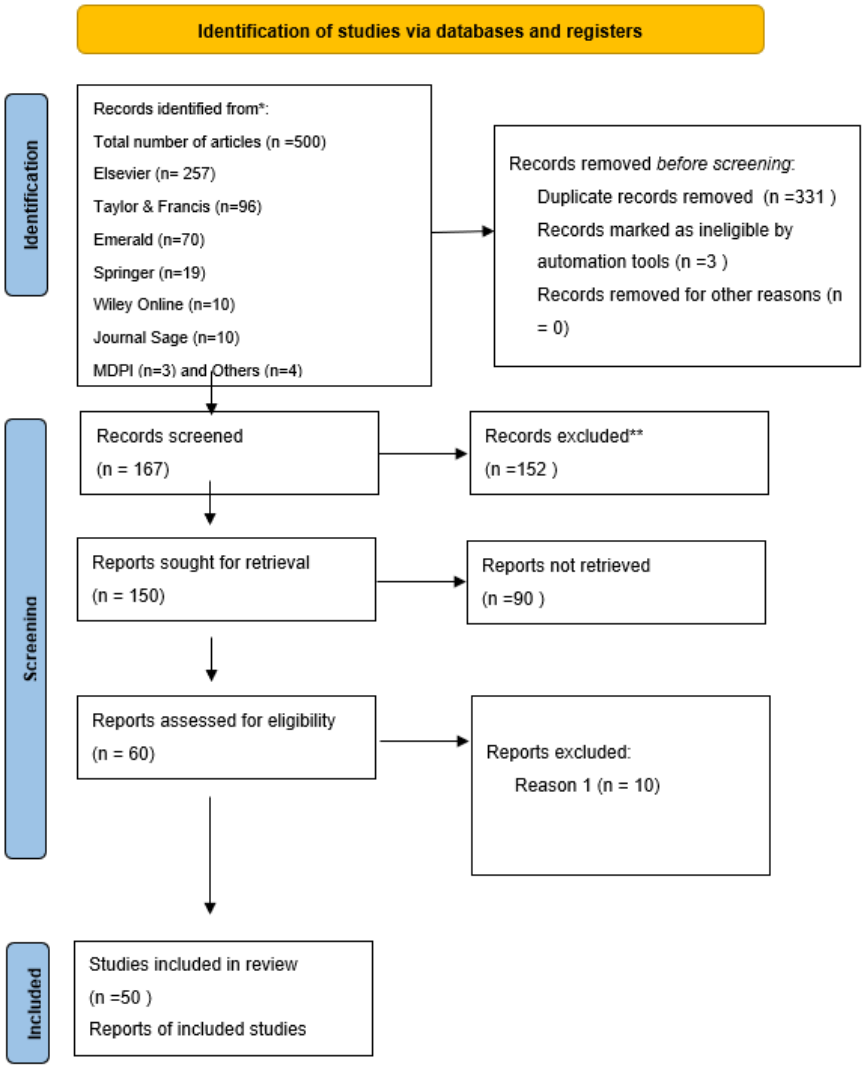

Figure 1. PRISMA Flowchart 2021

2.5. Quality Appraisal

The methodological quality of the 12 included studies was evaluated independently by two reviewers using the JBI Critical Appraisal Tools. For quantitative studies with analytical cross-sectional designs, the analytical checklist was utilized, while the qualitative checklist was applied for studies employing qualitative methods. These tools are widely recognized for assessing research rigor, including factors such as the congruence of methodology with objectives, the representation of participants' voices, ethical considerations, and the adequacy of interpretation and analysis [13]. Each tool featured specific components with response options of "yes," "no," "unsure," and "not applicable." For quantitative studies, eight components were assessed, while ten components were evaluated for qualitative studies. Scores were assigned as follows: "yes" received 1 point, while "no" and "unsure" scored 0 points. "Not applicable" responses were excluded from the total. Based on the scores, studies were categorized into three quality levels: excellent (above 75%), moderate (50–75%), or low (below 50%) [13].

Disagreements between the reviewers were addressed in three collaborative meetings held both in person and via Zoom. To enhance the quality assessment, one reviewer contacted the primary authors of nine studies to clarify details regarding inclusion and exclusion criteria and to identify confounding factors. Four authors responded with additional information, which improved the robustness of the evaluation. Despite some identified limitations, all 12 studies

were deemed relevant and were included in the review. The results of this critical appraisal, including quality ratings, are summarized in Tables 1 and 2.

2.6. Data Extraction

Data from the included studies were extracted using a self-developed extraction form designed to align with the objectives of this review. The form was tailored to capture critical details relevant to the research question, ensuring consistency and comprehensiveness across all studies. Key information extracted included study design, sample characteristics, methodology, variables related to Value Engineering (VE) implementation, and its impact on company performance metrics such as cost efficiency, productivity, and market competitiveness. The data extraction process was initially conducted by one author to maintain uniformity. This author piloted the extraction form with input from the other reviewers to ensure its relevance and accuracy. Throughout the process, the lead author engaged in regular consultations with co-authors to address ambiguities and refine the extracted data for completeness and reliability. The extracted data were organized systematically to facilitate subsequent analysis and synthesis, and key study characteristics are documented in Appendix 1 (included in the supplementary materials). This thorough and collaborative approach ensured that all relevant data points were accurately captured to address the study's objectives.

2.7 Data Analysis and Synthesis

Due to the heterogeneity in study designs and the diverse instruments used to assess the impact of Value Engineering (VE) on company performance, a meta-analysis was not feasible. Instead, the review followed the Synthesis without Meta-analysis (SWiM) approach, which provided a framework for synthesizing the results despite variations in the studies. The SWiM method enabled the grouping of studies with similar characteristics and guided the use of standardized metrics to report and interpret the findings. The data analysis and synthesis process was carried out in four main stages:

i. Study Summarization: Each study was summarized, focusing on key aspects such as its design, methodology, results, and quality assessment. This step ensured a comprehensive understanding of the studies' contributions to the review.

ii. Identification of Comparable Studies: Studies with similar methodologies, performance metrics, and contexts were identified and grouped together. This facilitated meaningful comparisons and the identification of consistent trends or outcomes.

iii. Data Availability Assessment: The available data from the grouped studies were examined to ensure they were suitable for synthesis. Any gaps in the data were also identified at this stage.

iv. Synthesis of Findings: The findings from the grouped studies were synthesized, highlighting the impact of VE on company performance, specifically in relation to cost efficiency, productivity, and competitiveness in Kuwait's automotive sector.

3. Analysis of the Result

3.1. Descriptive Characteristics of the Included Studies.

Figure 2 illustrates the distribution of journals by publication, showing that Elsevier accounts for the highest proportion (28%) of the studies, followed by Taylor & Francis (16%) and Emerald (14%). Other prominent publishers include Wiley Online Library (12%) and Springer (8%), while smaller contributions come from MDPI and Sage Journals (8% combined). The remaining 8% of publications are categorized as "Others," highlighting the diverse sources utilized in the included studies. This distribution reflects a concentration of research in established publishing platforms, suggesting their prominence in the academic dissemination of the reviewed topic.

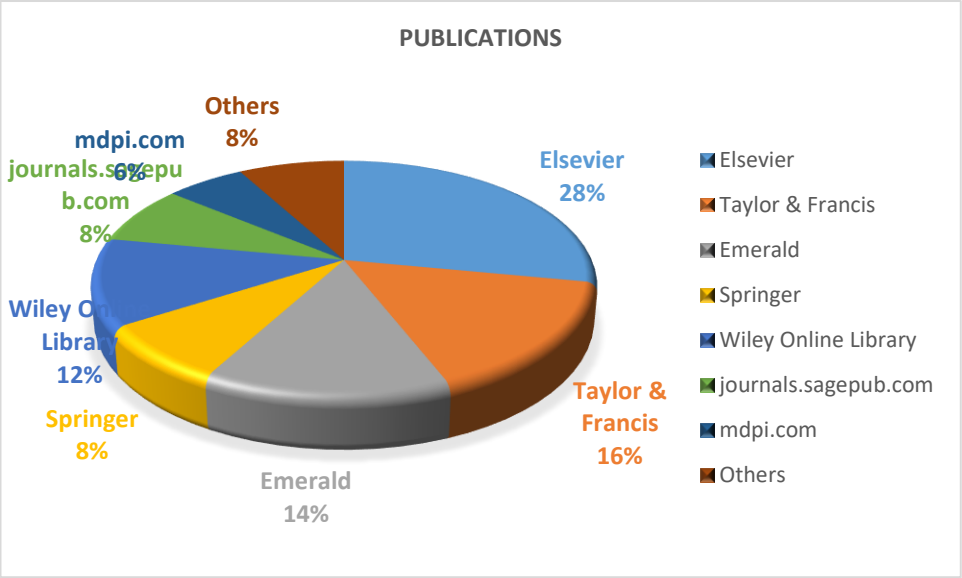

Figure 2. Distribution of the Journal by Publications

Figure 3 presents the percentage distribution of publications over the period 2015–2024. The highest percentage of publications occurred in 2019 (25%), followed by 2017 (23%), and 2018 (14%). Contributions from 2015 and 2020 were relatively lower, each accounting for 14% and 9%, respectively, while 2016 had 11%. The "Other" category, which includes publications from 2021, contributed 4%, and there were no publications reported in 2023 or 2024. This trend reflects a peak in research activity around 2017–2019, with a subsequent decline in the later years of the analyzed period.

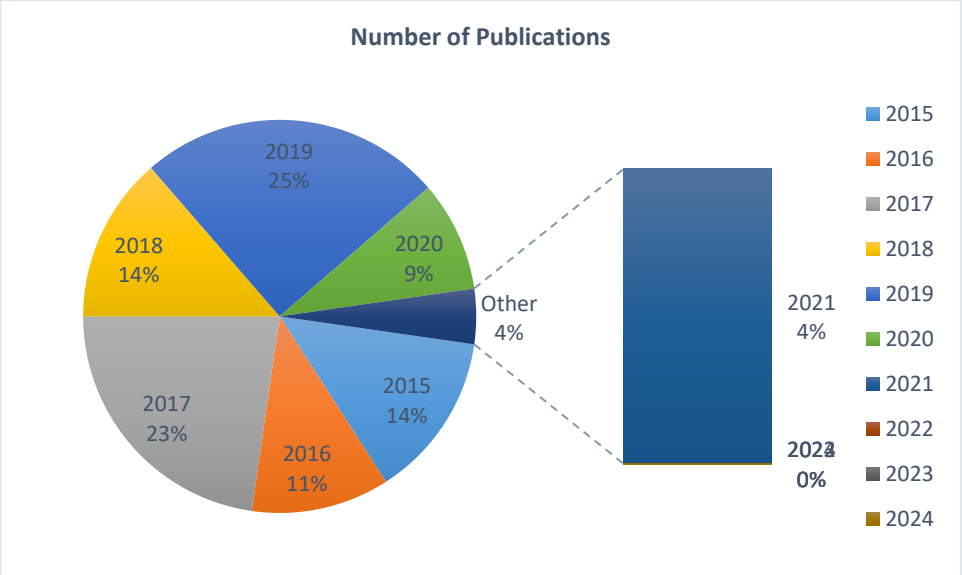

Figure 3. Percentage number of Publications Between the Period 2015-2024

Figure 4 illustrates the distribution of article citations over a specific period. The graph demonstrates significant fluctuations in citation counts, with several peaks where citations exceeded 300, and one notably surpassing 600. These spikes suggest that certain articles received significantly higher attention or were more influential compared to others. Meanwhile, most articles experienced lower and consistent citation levels, indicating variability in the impact and recognition of the published works during the analyzed timeframe.

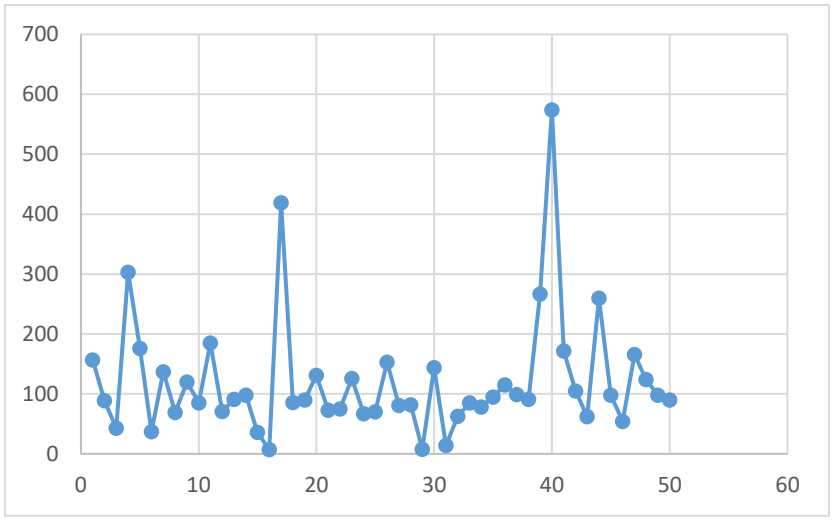

Figure 4. Article Citations Between the Period

Figure 5 illustrates the distribution of articles published within a specific period. The graph reveals a steady increase in article publications over the years, with a slight dip around 2015. While most years show a consistent number of articles, there are a few notable peaks, such as the significant surge in 2020. This suggests that certain periods experienced heightened research activity or publication incentives, leading to a higher number of articles being produced and disseminated during those years.

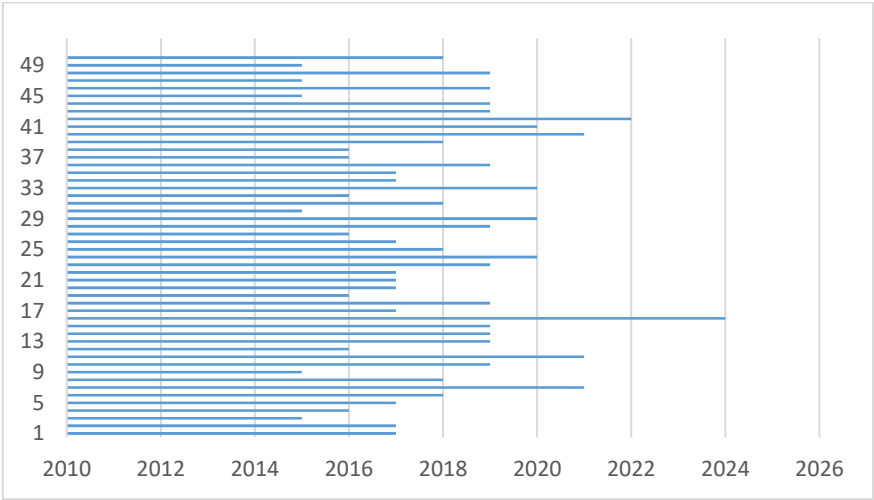

Figure 5. Distribution of Articles published within the Period

The descriptive characteristics of the included studies reveal significant gaps when viewed through the lens of critical advancements in cost optimization and efficiency techniques, which are central to value engineering and its relevance to company performance in the automotive industry in Kuwait. The dominance of publishers such as Elsevier and Taylor & Francis (Figure 2) suggests a preference for generalized, global frameworks that may overlook localized innovations or context-specific advancements crucial for industries in Kuwait. Furthermore, the peak publication years (2017–2019, Figure 3) align with broader global discussions on cost and efficiency techniques but show a concerning decline in research outputs post-2019, reflecting a lack of sustained scholarly attention on integrating evolving methods like digital tools or lean principles into value engineering. The citation trends (Figure 4) underscore this inconsistency, as spikes in recognition may suggest some studies provided impactful insights, yet the majority of works failed to translate into sustained practical application or refinement of cost-efficiency models. Finally, while publication trends in Figure

5 hint at periods of heightened academic interest, the absence of momentum in recent years implies a missed opportunity to address advancements in cost optimization strategies, especially in adapting to automotive industry dynamics and the specific economic conditions of Kuwait. These shortcomings make this study essential to reinvigorate the discourse and address the misalignment between theoretical value engineering and its practical, localized implementation.

4. Findings and Discussion of the Content Analysis

4.1 Findings from the Themes

The reviewed literature highlights several key themes related to the automotive industry, particularly focusing on value engineering and Performance in the Automotive Industry in Kuwai. These methodologies, including functional analysis, cost reduction, and process optimization, are instrumental in enhancing operational efficiency and eliminating non-value-added activities [14]. Decision-making methods are also crucial, providing support for engineering design and solving common engineering problems [15]. The Performance in the Automotive Industry and continuous improvement programs are extensively explored, emphasizing their role in fostering a culture of ongoing enhancement within the automotive sector [16]. Additionally, there is a growing emphasis on environmental and social values, reflecting the increasing pressure on the industry to adopt sustainable practices [17].

Technological innovations, such as additive manufacturing and digital transformation through Industry 4.0, are transforming the automotive industry, enabling more efficient and cost-effective production processes [18]. Quality management, particularly through quality problem-solving (QPS), plays a vital role in meeting the high expectations of customers [19]. The analysis of supply chain dynamics and value creation is another significant area, highlighting the importance of effective supply chain management in achieving competitive advantages [20]. The shift towards servitization and the integration of product-service systems (PSS) is also noted, reflecting a broader trend towards customer-centric business models [21]. Finally, risk management and sustainability practices are increasingly recognized as essential components of long-term success in the automotive sector [22].

4.2 Adopted Methodologies

The methodologies frequently employed in the reviewed studies include case studies, which provide detailed examinations of specific instances within the automotive industry to illustrate the application of various tools and practices [23]. Systematic reviews are also common, offering comprehensive syntheses of existing literature to identify trends and gaps [24]. Quantitative analysis, utilizing statistical methods and data analysis, is widely used to evaluate the impact of different practices on company performance [25]. Qualitative research, including in-depth interviews and observations, helps to understand the underlying factors influencing practices and outcomes [26]. Simulation and modeling techniques are employed to predict the outcomes of various strategies and interventions, providing valuable insights for decision-making [27].

Additionally, the use of benchmarking and best practice analysis is prevalent, allowing companies to compare their performance against industry standards and identify areas for improvement [28]. Experimental designs and controlled trials are also utilized to test the effectiveness of new methodologies and tools in real-world settings [29]. The adoption of digital tools and platforms for data collection and analysis has become increasingly common, enabling more accurate and timely insights [30]. Cross-sectional and longitudinal studies are employed to track changes over time and assess the long-term impact of various practices [31]. Finally, the integration of multidisciplinary approaches, combining insights from engineering, management, and social sciences, is seen as a key methodology for addressing complex challenges in the automotive industry [32].

4.3 Major Findings from the Review

The findings from the reviewed literature include the successful application of value engineering methodologies, leading to significant cost reductions and improved product quality [33]. Lean manufacturing and continuous improvement programs have enhanced operational efficiency and productivity, while technological innovations such as additive manufacturing and digital technologies have transformed the industry, enabling the production of high-quality vehicles at lower costs [34]. Effective quality management practices, including quality problem-solving, have met customer expectations and improved overall performance [35]. The automotive sector is increasingly focusing on environmental and social values, driving sustainability initiatives [36].

Furthermore, the value engineering has shown synergistic effects, leading to more comprehensive improvements in company performance [37]. The adoption of digital transformation and Industry 4.0 technologies has enabled real-time monitoring and optimization of production processes, further enhanced efficiency and reducing costs [38]. The shift towards servitization and product-service systems (PSS) has improved customer satisfaction and loyalty, reflecting a more customer-centric approach [39]. Risk management and sustainability practices have become integral to long-term success, ensuring compliance with regulatory requirements and enhancing corporate reputation [40].

4.4 Limitations

Despite the wealth of information, several research gaps remain. Many studies focus on specific aspects of value engineering or lean practices, but a comprehensive review of their combined impact on company performance is lacking [41]. There is a need for more research on the specific context of the Kuwaiti automotive sector, as well as the integration of value engineering with lean practices and other methodologies to achieve synergistic effects [42]. The long-term impact of these practices on company performance, including sustainability and risk management, requires further investigation [43]. Additionally, the perspectives of various stakeholders, including suppliers, customers, and policymakers, on the implementation of value engineering and lean practices are not well-documented [44].

Moreover, the role of digital transformation and Industry 4.0 in enhancing value engineering practices is underexplored, despite the potential for significant improvements in efficiency and cost reduction [45]. The impact of servitization and product-service systems (PSS) on company performance, particularly in the context of the Kuwaiti automotive industry, warrants further examination [46]. The effectiveness of risk management and sustainability practices in mitigating operational risks and enhancing corporate reputation needs more empirical validation [47]. Finally, the integration of multidisciplinary approaches, combining insights from engineering, management, and social sciences, is an area that requires more comprehensive research to address the complex challenges faced by the automotive industry [48].

4.5. Recommendation

Based on the findings and identified research gaps, it is recommended that the Kuwaiti automotive industry adopt a comprehensive approach that integrates value engineering with lean practices and other methodologies to achieve synergistic effects on company performance [41]. This approach should include the implementation of digital transformation and Industry 4.0 technologies to enhance efficiency and reduce costs [45]. Additionally, there is a need for more empirical research on the long-term impact of these practices, particularly in the context of sustainability and risk management [43]. Stakeholder perspectives, including those of suppliers, customers, and policymakers, should be considered to ensure the successful implementation of value engineering and lean practices [44]. Finally, the integration of multidisciplinary approaches, combining insights from engineering, management, and social sciences, is essential for addressing the complex challenges faced by the automotive industry

[48]. By addressing these recommendations, the Kuwaiti automotive industry can enhance its operational efficiency, reduce costs, and achieve sustainable competitive advantages.

5. Conclusion

This systematic review has synthesized existing empirical research on the relationship between value engineering practices and company performance in the Kuwaiti automotive industry. The findings highlight the significant benefits of integrating value engineering with lean practices, digital transformation, and other methodologies to enhance operational efficiency, reduce costs, and improve overall company performance [41, 45]. However, there are still research gaps that need to be addressed, particularly concerning the long-term impact of these practices, stakeholder perspectives, and the integration of multidisciplinary approaches [43, 44, 48]. By adopting the recommended comprehensive approach and conducting further empirical research, the Kuwaiti automotive industry can achieve sustainable competitive advantages and meet the evolving demands of the global market.

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