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Assessing Supply Chain Quality Management Indicators: A Roadmap to Operational Excellence at Al-Zawraa General Company's Altahady Site

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Abstract:

This research endeavors to assess and enhance supply chain quality management at the Al-Tahady Site of Al-Zawraa General Company. The primary objective is to evaluate a comprehensive set of supply chain quality management indicators and provide a strategic roadmap for achieving operational excellence. The research problem addressed in this study revolves around the need to improve supply chain quality management practices. Despite the inherent challenges in real-world supply chain research, particularly in data acquisition and information gathering, this study is resolute in its mission. Beyond analysis, the researcher seeks to propose practical application mechanisms to drive tangible benefits for the company in attaining its operational goals. The examination of key supply chain quality management indicators reveals significant insights. Notably, the compliance rate consistently falls within the range of (1.04%) to (1.24%), affirming unwavering commitment to meeting purchase orders and contract standards. Transmission accuracy exhibits a parallel consistency, ranging between (1.04%) and (1.24%), signifying a remarkable precision in deliveries. The punctuality commitment is evidenced by on-time delivery rates, fluctuating from (91%) to (93%). Additionally, this study unveils fluctuations in supplier lead times, varying from (0.16%) to (0.55%). These variations serve as valuable signals, highlighting areas ripe for supplier management improvement. Furthermore, the prudent cost management practices implemented by the company are substantiated by total procurement costs ranging from (239,400,000) to (277,200,000). this research constitutes a concerted effort to elevate supply chain quality management at Al-Zawraa General Company's Al-Tahady Site. Its findings provide actionable insights aimed at enhancing supply chain performance, boosting customer satisfaction, and fortifying competitiveness.

Paper type: Research paper.
Keywords: Supply Chain Management, Indicators, Quality Management, Al-Zawraa General Company.

1.Introduction:

Supply chain management is a new concept and started in the post of last century, where the typical organization was organized that supply chain management functions are of little importance in that to achieve quality products, however during the last conference many radical changes under the transformation of business into Increasingly silent on the quality of supply chain management, resulting from converging changes in customer expectations, product management, organization, technology, functions and opportunities provided by supply chain partnerships, and exploring new ways to reduce total costs and speed the flow of value through the supply chain. Professional management of the supply chain is the most important points today (Ross, 1988). The concept of SCQM has attracted the attention of academics and business managers, and many organizations have begun to realize that SCQM is the key to creating a sustainable competitive advantage for their products in an increasingly crowded market. In the supply chain, quality plays an important role in operational performance, customer satisfaction, financial performance, etc. along the supply chain (Kaynak, 2008). The concept of SCQM has gained increasing recognition as a very important topic for theorizing and research, yet it can be said that much of the discussion in this area has relied on theoretical inferences from Quality Management or Supply Chain Management practices. In very few cases has the two concepts been linked rather than directly empirically examined SCQM practices as a completely independent topic and field of study (Soares, 2017). Supply chain quality management is an extension of supply chain management, which includes quality management (supporting suppliers, customer focus and guidance, strategic planning and leadership, continuous improvement and learning, empowerment and teamwork, focus on human resources, management structure, and quality tools) and supply chain management. (Transportation and logistics, marketing, continuous improvement and learning of organizational behaviour, best practices, supply base integration, relationships and partnerships, strategic management) (Robinson and Malhotra, 2005). Expanding the concept of supply chain quality management to manufacturing organizations by taking advantage of the resources and capabilities of internal and external supply chain partners to achieve high levels of quality-related performance at low costs (Flynn, 2005). This shift in supply chains from SCM to supply chain quality management (SCQM) also helps organizations build a highly efficient supply chain that focuses on reducing costs (Chau, 2021).

The definition of the belief that the relationship between buyers and suppliers is a prerequisite for sustainable quality performance across the supply chain. More recently, SCQM has been viewed as a synergistic effect between supply chain management and quality management, which is key to improving performance across the supply chain. Through the development of this approach (Robinson and Malhotra, 2005) defined "supply chain quality management as the formal coordination and integration of business processes involving all partner organizations in the channel that provides measurement and continuous improvement of our products and processes to create value, achieve customer satisfaction with the market and ultimately". Towards More Efficient Supply Chain Performance, "either as a system-based approach to improving performance by using opportunities generated downstream and starting with suppliers and customers". It also referred to seven topics related to supply chain quality management including: (1) customer focus, (2) quality practices, (3) relationships with suppliers, (4) leadership, (5) human resource management practice, (6) business results, and (7) safety (Foster, 2008). Recently, researchers have considered SCQM as a multidisciplinary concept including internal quality management (IQM) consisting of process management, product design, process, quality training, and quality management activities at the supply chain level (collaboration with customers and suppliers), quality training in supply chain level, member participation in the product design process (Hong, 2018).

1.1 Literature review :

The Many studies were discussed and reviewed. Phan et al (2019) investigated how supply chain quality management practices affect operational performance in Vietnamese manufacturing companies, involving 100 firms. It addresses the lack of empirical evidence in this context and employs a questionnaire. The findings reveal a positive impact of downstream quality management practices on quality, cost, and delivery performance. While sharing a focus on supply chain quality management and its impact on performance with the current study, it differs in sample selection, methodology, and focus on a single tool compared to the broader approach here. The study also offers an intellectual review of supply chain quality management concepts and relevant literature, strengthening the understanding of this critical area. Ramos et al (2020) an unnamed study investigated how Supply Chain Quality Management (SCQM) affects operational results in asparagus-producing companies. The study identified crucial factors impacting asparagus supply chain quality and proposed a tailored SCQM model for improved operational outcomes. Tools included a literature review, case studies, and DMAIC methodology. Key findings emphasized critical factors, the proposed SCQM model, and the efficacy of DMAIC for enhancing supply chain quality management in this industry. Hong et al (2020) Focused This study on small food manufacturing enterprises in China, explores the impact of Supply Chain Quality Management (SCQM) practices on quality safety and sales performance. It also examines how social co-regulation can moderate these relationships. While the study's specific title and year are not provided, it employs a quantitative approach, utilizing questionnaires and statistical analysis with a sample of 203 valid responses. The research aims to understand how SCQM practices influence firm performance in China's food industry, considering the moderating role of social co-regulation. Sharma (2020) tackled the challenge of selecting the best digital supplier to enhance quality management in digital supply chains within the manufacturing industry. They aimed to identify key factors for supplier selection and evaluate alternatives. Employing the SWARA-WASPAS methods and a systematic literature review, the study identified influential factors and provided a structured framework for supplier evaluation. It showcased the effectiveness of these methods in reducing uncertainty and subjectivity in decision-making. Chau et al (2021) conducted a study in China, identifying critical success factors (CSFs) for improving supply chain quality management (SCQM) in manufacturing. Their survey of 132 manufacturers highlighted customer focus and supplier quality management as key factors driving SCQM. While their study aligns with the goal of enhancing SCQM in manufacturing, it differs from the current research in terms of context, sample, methods, and tools used. Nevertheless, both studies contribute to the understanding of SCQM, with Chau et al.'s work offering insights into CSFs specific to manufacturing. They also conducted an intellectual review to establish SCQM concepts and considered previous relevant studies. Farshad (2021) presented a framework for evaluating quality management systems in the automotive industry and supply chain management to enhance organizational sustainability. It falls under applied research and utilizes a questionnaire for data collection, TOPSIS method for criteria ranking, and DEMATEL method for cause-and-effect analysis. Key findings include the selection of 21 criteria for evaluation, with the social dimension ranked highest in sustainability importance. Additionally, training, quality, and staff efficiency are identified as pivotal factors for improving organizational sustainability. Luo et al (2023) reviewed a study in China focusing on the impact of supply chain quality leadership on quality integration and performance. They surveyed 400 factories in the Chinese manufacturing industry, addressing the lack of research in this area. Their findings revealed a significant positive correlation between supply chain quality leadership and quality integration and performance. While this study differs in its scope, sample, and methods from the current research, it contributes valuable insights to the field of supply chain quality management in the Chinese context. It also emphasizes the potential benefits of visual assurance systems and highlights the importance of previous studies on supply chain quality management.

The research problem addressed in this study revolves around the need to improve supply chain quality management practices within the Al-Tahady Site of Al-Zawraa General Company. While the specific problem areas are not detailed in the given information, the overarching challenge is to identify and address issues or inefficiencies in the company's supply chain processes that impact quality management. This research aims to pinpoint these challenges, propose solutions, and provide a strategic roadmap for achieving operational excellence in supply chain quality management.

The research objectives are multifaceted, encompassing a thorough evaluation of supply chain quality management at Al-Zawraa General Company's Al-Tahady Site. We aim to assess existing quality indicators, analyze key performance metrics, and create a strategic roadmap for operational excellence. Practicality is a core objective, focusing on proposing actionable strategies and mechanisms to enhance quality management. We will investigate fluctuations in supplier lead times and scrutinize cost management practices, seeking opportunities for cost-effectiveness. These objectives collectively intend to empower the organization with insights and recommendations, ultimately improving supply chain performance, customer satisfaction, and competitive positioning within the industry.

2.Material and Methods:

Supply chain quality management relies on a comprehensive set of indicators to ensure the smooth flow of goods and services while maintaining high standards of performance. Focusing on any one aspect, such as cost containment, can be short-sighted and potentially detrimental to the overall health of the supply chain, so a balanced approach that includes various key indicators is essential for effective assessment and management. One vital indicator is the compliance order rate, which assesses how accurately purchase orders or contracts are fulfilled. It helps ensure that the products or services provided strictly conform to specified standards, reducing potential discrepancies and disruptions.

Shipping accuracy is another important metric to measure the accuracy of deliveries. It evaluates how often the supply chain delivers the correct items without errors, ensuring customer satisfaction and effective cost control. On-time delivery plays a pivotal role in achieving customer satisfaction. It measures a supply chain's ability to meet delivery deadlines, reduce downstream disruptions and enhance trust with customers. Processor timeout variability (APD - actual performance deviation) evaluates the variance between expected and actual processing times. It identifies bottlenecks and inefficiencies in processes, enabling timely adjustments. In addition, procurement cost is a key factor in evaluating the efficiency of supply chain operations, including the various costs associated with purchasing activities.

2.1 Analysis of Supply Chain Quality Management Indicators:

These indicators, when used with other indicators such as inventory turnover rate, supplier performance scores, delivery lead time, return rate, and customer satisfaction surveys, create a comprehensive view of supply chain performance. Regularly monitoring and analysing these indicators provides insights for continuous improvement, ultimately enhancing the overall effectiveness and efficiency of the supply chain. Achieving a balance between these measures ensures that supply chains not only improve costs, but also provide quality, reliability, and customer satisfaction. Table (1) displays data on supply chain quality management indicators. The following are indicators of supply chain quality management:

$$Compliance\ request = \frac{The\ number\ of\ applications\ that\ meet\ all\ criteria}{Total\ number\ of\ orders\ executed} \times 100 \qquad (1)$$

$$Transmission\ accuracy = \frac{Number\ of\ volume\ lines\ shipped\ without\ errors}{Total\ number\ of\ line\ volumes\ shipped} \times 100 \qquad (2)$$

$$On\ time\ delivery = \frac{The\ number\ of\ orders\ delivered\ by\ the\ requested\ date}{Total\ number\ of\ orders\ delivered} \times 100 \qquad (3)$$

$$Processor\ timeout\ fluctuation = \frac{APD\ =\ Expected\ Lead\ Time\ -\ Actual\ Lead\ Time}{Total\ number\ of\ orders\ delivered} \times 100 \qquad (4)$$

Table 1: Supply chain quality management indicators data

1. Data on supply chain quality management indicators						
Index	2017	2018	2019	2020	2021	2022
1.1 The number of orders that meet all criteria specified in the purchase order or contract	8307	7059	3154	3037	2905	7551
2.1 Total number of orders executed	6646	6418	3004	2641	2641	6293
3.1 Number of volume lines shipped without errors	8307	7059	3154	3037	2905	7551
4.1 Total number of line volumes shipped	6646	6418	3004	2641	2641	6293
5.1 Number of orders delivered by the requested date	6181	5937	2764	2430	2404	5853
6.1 Total number of orders delivered	6646	6418	3004	2641	2641	6293
7.1 Expected lead time	180	160	70	60	60	140
8.1 Actual lead time	120	110	60	50	50	90
9.1 Staff cost + Communications cost + Office space cost + Dedicated computer equipment cost + Other related costs during a specified period of time	277,200,000	277,200,000	256,200,000	243,600,000	239,400,000	268,800,000

When evaluating and analyzing the indicators of supply chain quality management at the Altahady site, the researcher relies on data and information in the factory. Table (2) displays the evaluation and analysis indicators at the Altahady factory for the production of filters for the period (2017-2022) with a statement of the aforementioned indicators and methods of measuring them. The researcher relies when measuring These indicators are based on records, documents, paper and electronic documents, and personal interviews with site managers and existing factories, and in coordination with senior management, the Planning and Studies Department, site research and development, and the management of the Altahady Factory, for the purpose of providing an accurate analysis to the site in identifying indicators that can improve the production process in the factory.
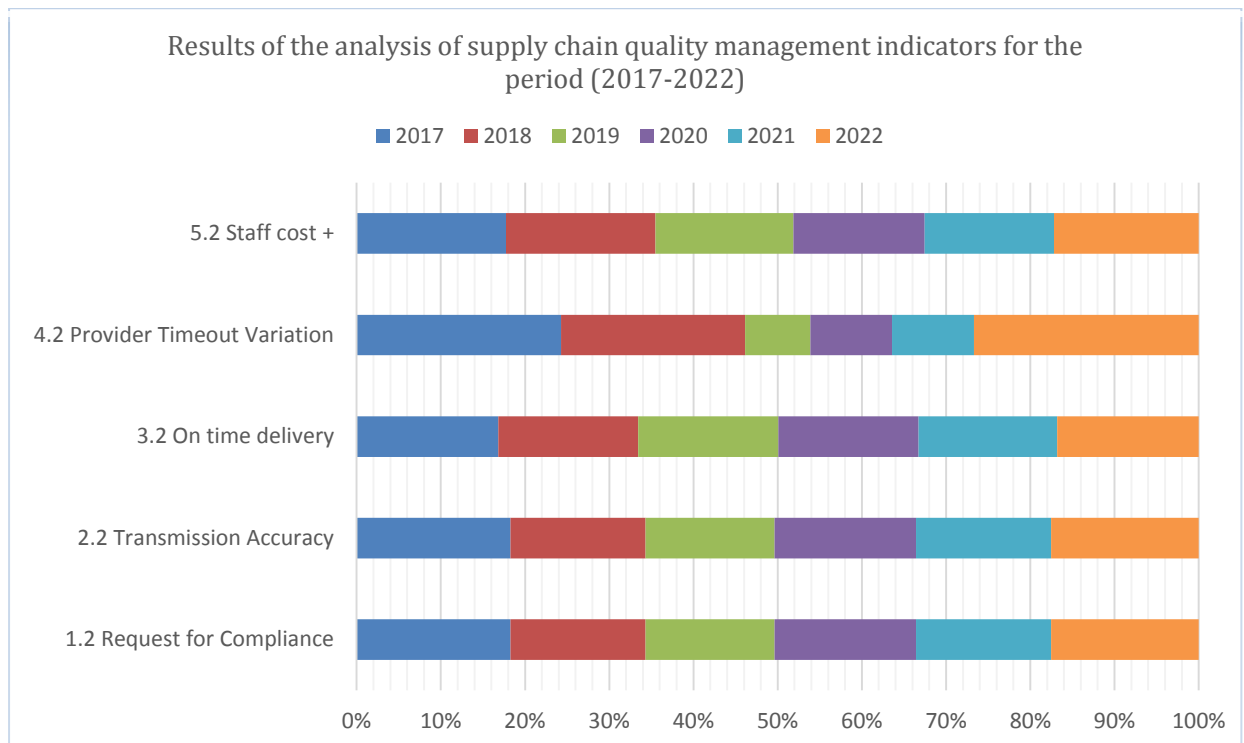
Table 2: Evaluation and analysis of supply chain quality management indicators for the period (2017 - 2022)

2. Evaluation and analysis of supply chain quality management indicators						
Index	2017	2018	2019	2020	2021	2022
1.2 Request for Compliance	%1.24	%1.09	%1.04	%1.14	%1.09	%1.19
2.2 Transmission Accuracy	%1.24	%1.09	%1.04	%1.14	%1.09	%1.19
3.2 Delivery time	%93	%92	%92	%92	%91	%93
4.2 Provider Timeout Variation	%0.5	%0.45	%0.16	%0.2	%0.2	%0.55
5.2 Staff cost + Communications cost + Office space cost + Dedicated computers cost + Costs	277,200,000	277,200,000	256,200,000	243,600,000	239,400,000	268,800,000

Analysis of the data presented in Table (2) results in different performances of supply chain quality management indicators over a specific period of time. The compliance rate ranged from (1.04%) to (1.24%) during the period, indicating relatively consistent performance in meeting purchase orders or contract standards, and it is necessary to investigate any fluctuations to identify potential issues affecting compliance. As with compliance, the charging accuracy rate also shows consistency, ranging between (1.04%) and (1.24%). This indicates that the supply chain maintains a relatively high level of accuracy in delivering the correct items without errors, and on-time delivery rates range from (91%) to (93%) during this period. Although the difference is not large, constantly striving to achieve higher on-time delivery rates can further improve customer satisfaction and supply chain reliability, and the supplier lead time fluctuation ranges from (0.16%) to (0.55%). This indicator measures the discrepancy between expected and actual processing times. A higher volatility rate may indicate inconsistencies in the performance of suppliers, which should be investigated and addressed. The total cost associated with procurement activities ranges between (239,400,000) and (277,200,000). Monitoring these costs is critical to achieving cost effectiveness. Decreasing costs over time may indicate effective cost management.

The five-year plan for achieving operational excellence in supply chain quality management from 2017 to 2022 involves a structured approach to improvement. The first year sets the baseline with data analysis and KPI development. In year two, the focus shifts to enhancing compliance and accuracy, with audits, training, and continuous tracking. Year three prioritizes on-time delivery and supplier lead time by collaborating closely with suppliers, investing in technology, and implementing performance metrics. Year four is dedicated to cost management, analyzing data for savings, and continually adapting cost-saving strategies. Year five consolidates gains and sustains improvements while nurturing a culture of continuous improvement.

The indicators presented provide valuable insights into supply chain performance and while some indicators show consistency, such as compliance and shipping accuracy, others such as supplier lead time variability show variation that requires closer examination. Continuous monitoring and analysis of these indicators will enable informed decisions to be made and improvements implemented when necessary to improve performance, cost effectiveness and customer satisfaction. The bar chart of the analysis results is shown in Figure (1).

Figure 1: Results of the analysis of supply chain quality management indicators for the period (2017 - 2022)

3. Discussion of Results :

In the "Discussion of Results" section, we examine the performance of supply chain quality management indicators over a specific period, as presented in Table 2. The data reveals intriguing insights into the supply chain's operational excellence and areas where potential improvements may be needed. First, we observe that the compliance rate, ranging from 1.04% to 1.24% during the period, demonstrates consistent performance in meeting purchase orders or contract standards. This consistency suggests a strong adherence to quality management practices within the supply chain. However, the narrow range also indicates limited variation, prompting us to investigate any subtle fluctuations that might indicate underlying issues affecting compliance. Similarly, the charging accuracy rate remains remarkably stable, fluctuating between 1.04% and 1.24%. This consistency reflects a commendable level of accuracy in delivering the correct items without errors. However, as accuracy is paramount in supply chains, continuous efforts should be made to maintain and possibly enhance this level of precision. The on-time delivery rates, varying from 91% to 93% during the study period, showcase an admirable commitment to punctuality. While the differences might appear marginal, the pursuit of higher on-time delivery rates can further boost customer satisfaction and solidify the supply chain's reputation for reliability. An intriguing indicator is the supplier lead time fluctuation, which ranges from 0.16% to 0.55%. This measure highlights the discrepancy between expected and actual processing times. A higher volatility rate may signal inconsistencies in supplier performance, warranting a closer examination and potential adjustments

in supplier management strategies. Lastly, the total cost associated with procurement activities, ranging from 239,400,000 to 277,200,000, underscores the importance of cost monitoring. Decreasing costs over time hint at effective cost management practices, but it's vital to continue scrutinizing expenses to ensure long-term cost-effectiveness. the analysis of supply chain quality management indicators reveals a generally robust performance, characterized by consistent compliance, accuracy, and punctuality. However, it also highlights the importance of vigilance in monitoring and addressing subtle fluctuations. To maintain and enhance operational excellence, it is recommended to focus on further improving accuracy, on-time delivery rates, and supplier lead time consistency. Additionally, continued cost management efforts will contribute to the overall effectiveness of the supply chain. These findings offer valuable insights for supply chain managers aiming to sustain and elevate the quality of their operations.

4.Conclusion:

In assessing the supply chain quality management indicators at the Altahady Site of Al-Zawraa General Company, this study sheds light on the operational excellence achieved within the examined period. The analysis revealed commendable consistency in compliance rates, charging accuracy, and on-time delivery performance. These findings underscore the organization's commitment to meeting customer requirements and maintaining a high level of accuracy and reliability. However, the supplier lead time fluctuations suggest the need for a closer examination of supplier performance to ensure more consistent supply chain operations. Additionally, the emphasis on monitoring procurement costs has demonstrated effective cost management practices, contributing to cost-effectiveness. In summary, this research highlights the supply chain's strengths and areas for improvement. To sustain and elevate operational excellence, it is recommended to continue efforts in enhancing accuracy, punctuality, and supplier management strategies. By doing so, Al-Zawraa General Company can further enhance customer satisfaction, supply chain reliability, and overall performance. These findings provide valuable insights not only for the Altahady Site of Al-Zawraa General Company but also for organizations aiming to optimize their supply chain quality management indicators and achieve operational excellence in a competitive business environment. To maintain operational excellence, Al-Zawraa General Company should prioritize continuous supplier performance monitoring and consistency in supplier lead times.

5.Further Work:

This study lays the foundation for future research in supply chain quality management. Investigating supplier relationship strategies, prolonged study periods, external factors' impact, and advanced data analytics methods could provide deeper insights into enhancing operational excellence. Additionally, conducting comparative studies with similar organizations offers valuable benchmarking opportunities, contributing to the continual improvement of supply chain practices. These avenues for further research can support organizations, including Al-Zawraa General Company, in their quest to optimize supply chain performance, meet customer expectations, and maintain a competitive edge in the dynamic business environment.

6.Acknowledgments:

Authors Declaration:

Conflicts of Interest: None

-We Hereby Confirm That All The Figures and Tables In The Manuscript Are Mine and Ours. Besides, The Figures and Images, Which are Not Mine, Have Been Permitted Republication and Attached to The Manuscript.

- Ethical Clearance: The Research Was Approved By The Local Ethical Committee in The University.

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تقييم مؤشرات إدارة جودة سلسلة التجهيز: خارطة طريق للتميز التشغيلي في موقع التحدي لشركة الزوراء العامة

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مستخلص البحث:

يسعى هذا البحث إلى تقييم وتعزيز إدارة جودة سلسلة التجهيز في موقع التحدي التابع لشركة الزوراء العامة. الهدف الأساسي هو تقييم مجموعة شاملة من مؤشرات إدارة جودة سلسلة التجهيز وتوفير خارطة طريق استراتيجية لتحقيق التميز التشغيلي. تدور مشكلة البحث التي تتناولها هذه الدراسة حول ضرورة تحسين ممارسات إدارة جودة سلسلة التجهيز. على الرغم من التحديات الكامنة في أبحاث سلسلة التجهيز في العالم الحقيقي، ولا سيما في الحصول على البيانات وجمع المعلومات، فإن هذه الدراسة حازمة في مهمتها. وبعيداً عن التحليل، يسعى الباحث إلى اقتراح آليات التطبيق العملي لتحقيق فوائد ملموسة للشركة في تحقيق أهدافها التشغيلية. يكشف فحص مؤشرات إدارة جودة سلسلة التجهيز الرئيسية عن رؤى مهمة. والجدير بالذكر أن معدل الالتزام يقع باستمرار ضمن نطاق (1.04%) إلى (1.24%)، مما يؤكد الالتزام الثابت بتلبية أوامر الشراء ومعايير العقود. وتظهر دقة الشحن تناسقاً متوازياً يتراوح بين (1.04%) و(1.24%)، مما يدل على دقة ملحوظة في عمليات التسليم. ويتجلى الالتزام بالمواعيد من خلال معدلات التسليم في الوقت المحدد، والتي تتأرجح من (91%) إلى (93%). بالإضافة إلى ذلك، تكشف هذه الدراسة عن تقلبات في فترات انتظار الموردين، تتراوح من (0.16%) إلى (0.55%). تعمل هذه الاختلافات بمثابة إشارات قيمة، حيث تسلط الضوء على المجالات الجاهزة لتحسين إدارة الموردين. علاوة على ذلك، فإن الممارسات الحكيمة لإدارة التكاليف التي تنفذها الشركة يتم دعمها من خلال إجمالي تكاليف المشتريات التي تتراوح من (239,400,000) إلى (277,200,000). يشكل هذا البحث جهداً متضافراً لرفع مستوى إدارة جودة سلسلة التجهيز في موقع التحدي التابع لشركة الزوراء العامة. توفر النتائج التي توصلت إليها رؤى قابلة للتنفيذ تهدف إلى تعزيز أداء سلسلة التجهيز، وتعزيز رضا الزبائن، وتعزيز القدرة التنافسية.

نوع البحث: ورقة بحثية.

المصطلحات الرئيسة للبحث: إدارة سلسلة التجهيز ، المؤشرات، إدارة الجودة، شركة الزوراء العامة.

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[2] البحث مستل من أطروحة.
[3] دور إدارة جودة سلسلة التجهيز في تحقيق الإنتاج المستدام بتوسيط مقدرة العملية / دراسة حالة في شركة الزوراء العامة – موقع التحدي.