Investigating the relationship between information quality, system quality, service quality, and supply chain performance in the manufacturing sector of Saudi Arabia: An empirical study

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A B S T R A C T

This research investigates the links between information quality, service quality, system quality, and supply chain performance in Saudi Arabia's manufacturing sector. The goal is to provide insights into the elements that impact supply chain outcomes and to identify critical performance drivers. Data was acquired from a sample of manufacturing organizations, and the correlations were analyzed using a structural equation modeling technique. Information quality, service quality, and supply chain performance are all shown to have substantial positive correlations. Higher levels of information quality and service quality relate to enhanced supply chain performance in the manufacturing sector. However, system quality was shown to have a comparatively smaller influence on supply chain performance, suggesting that investments in information management systems and service delivery methods may offer higher returns. The reliability and validity of the measuring scales employed in this research were evaluated and determined to be strong, assuring the precision and consistency of the findings. These results add to the current research by identifying the unique elements that influence supply chain performance in Saudi Arabia's manufacturing sector. The study has many implications for practitioners in the manufacturing sector as it discusses the significance of investing in information management systems, providing high-quality services, and continually evaluating and improving supply chain performance. Organizations may improve their competitiveness and create better supply chain results by concentrating on these areas. Additional elements and possible moderating or mediating variables may be investigated in future studies to acquire a better knowledge of the dynamics that impact supply chain performance. Overall, this research offers significant insights for practitioners and decision-makers in the manufacturing industry, directing them towards more appropriate methods to maximize supply chain performance and achieve long-term success.

1. Introduction

The manufacturing sector in Saudi Arabia is a critical part of the country's economy, and it is one of the largest industries in the Middle East (Yas, Alsaud, Almaghrabi, Almaghrabi, & Othman, 2021). As with any industry, supply chain management plays a vital role in ensuring that products are delivered on time, in the right quantity and quality, and at a competitive cost (Al-Rawashdeh, Jawabreh, & Ali, 2023). Quality is a crucial aspect of manufacturing operations, as it can impact a company's reputation and competitiveness in the market (Gauder, Gölz, Jung, & Lanza, 2023; Hani, 2022).

Supply chain management is essential in today's fast-paced and globalized business world. The supply chain's efficiency is highly dependent on the accuracy and reliability of the data, infrastructure, and services that underpin it. By placing a premium on these aspects of quality, businesses can boost their supply chain's efficiency, cut costs, and boost client happiness (Ali, 2022). Specifically, the quality of information, systems, and services can have a major effect on a business's bottom line (Ali & Oudat, 2021; Coo & Verma, 2002). A supply chain's information quality can be measured by how precise, comprehensive,

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and up-to-date its data is (Abdelraheem, Hussaien, Mohammed, & Elbokhari, 2021).The quality of a system is measured by how well it functions and how easy it is to use (Alhaj et al., 2023; Trendowicz et al., 2023). in the context of the supply chain. Quality of service is defined as the degree to which a company satisfies its customers' needs and wants in terms of service (Ananda & Rachmawati, 2023; Shan et al., 2022).

There is a lack of research into the connection between quality and supply chain performance in Saudi Arabia's industrial sector, despite the importance of quality and supply chain management in production. This research intends to close that knowledge gap by applying the DeLone and McLean framework to the manufacturing industry in Saudi Arabia and examining the effect of information, system, and quality of service on supply chain performance.

Researchers have developed a number of frameworks and models to better understand the effect of these quality parameters on supply chain performance. The DeLone and McLean information systems success model is a popular theory that suggests that user happiness and system success are driven by information system quality, service quality, and system utilization (Iqbal & Rafiq, 2023).This model has been used in a variety of settings, including to analyze company performance (Didem & Tüzün, 2023; Shniekat, AL_Abdallat, Al-Hussein, & Ali, 2022), yielding useful insights into the connection between data integrity, system reliability, service consistency, and bottom-line results (Kanan et al., 2022a, 2022b; Kanan et al., 2023).

The paper will provide an overview of the literature on quality and supply chain management; describe the research methodology and data analysis; report the results and conclusions of the study; and provide a discussion of the implications of the study. Finally, we'll talk about what this report means for the Saudi Arabian manufacturing industry.

2. Literature Review

In recent decades, the relevance of supply chain management has grown in a variety of businesses (Al-Rawashdeh et al., 2023; Ali, 2022). Supply chain management refers to the administration and coordination of all processes involved in the creation and distribution of a product or service (Ju, Hou, & Yang, 2021). A variety of factors, such as the quality of information, technologies, and services used across the supply chain, contribute to the efficiency of supply chain management. Success in business has been linked to the quality of information, systems, and services (Ali, Bakar, & Omar, 2016; Ali, Omar, & Bakar, 2016). DeLone and McLean's method (Ali, Omar et al., 2016; Sunarta & Astuti, 2023) has been widely utilized to assess the impact of IT on business outcomes. As a well-known approach, the DeLone and McLean framework (Ali, Bakar, et al., 2016; Nawaiseh et al., 2022) provides a set of interrelated criteria for evaluating the impact of IT on business performance. (Setiadi, Kraugusteeliana, Risdwiyanto, Bakri, & Arief, 2023) The framework comprises six different factors: system quality, information quality, service quality, usability, user satisfaction, and net benefits. However, the DeLone and McLean framework has not been extensively utilized to investigate the effect of information, system, and quality of service on the efficiency of supply chains performance (Ali, Bakar et al., 2016; Ali, Omar et al., 2016; Ali & Oudat, 2021; Didem & Tüzün, 2023; Iqbal & Rafiq, 2023; Setiadi et al., 2023), This research intends to fill that vacuum by investigating the link between information, system, and service quality on supply chain performance in Saudi Arabia's industrial sector using the DeLone and McLean framework.

Hani (2022) proposed a paradigm for merging information quality, with consideration for contextual and representation relevance, as well as intrinsic correctness, in supply chain management practices to improve supply chain performance in Saudi firms. The inferential approach was used to investigate the interaction between the study's components. The research discovered a substantial relationship between information quality and SCP, as well as a significant relationship between SCMPs and SCP. Furthermore, it was discovered that the quality of information might greatly limit the interaction between SCP and SCMPs. Putra et al. (2020) sought to establish a partnership between distributors and retailers. According to the study's findings, information quality may help to improve supplier relationship management, but this alone is not enough to improve supply chain flexibility and consumer satisfaction. The supplier relationship management, created by distributors, may have an influence of 0.611 on supply chain flexibility in retail and an impact of 0.367 on retail satisfaction firms. A closer connection between the distributor and the store may boost distributor flexibility and consumer satisfaction. Distributor organizations' supply chain flexibility may have a substantial influence on the retail satisfaction of 0.463. Kankam et al. (2023) demonstrated the strong link between buyer and supplier relationships in terms of information exchange, information quality, and supply chain effectiveness. The findings revealed that 20 manufacturing organizations recognized mediation's information-sharing role. The study found that information-sharing had a partly mediating influence between information quality and supply chain performance satisfaction. Ellitan and Muljani (2017) investigated the impact of information-sharing and information quality on supply chain performance in the manufacturing industry. The research discovered that antecedent factors, such as environmental uncertainty, intra-organizational variables, and inter-organizational factors, influenced the exchange of information and information quality in supply chain management. Kerdpitak (2022) investigated how new management techniques, such as collaborative networks, online advertising, service quality, and supply chain management, may boost the potential performance of cultural tourism in Thailand. The results suggested that success in cultural tourism is based on creative management, service quality, online advertising, and supply chain management. (Sundram, Chandran, & Bhatti, 2016) investigated the complicated interaction between various supply chain practices, supply chain integration (SCI), and supply chain performance (SCP) in the Malaysian electronics industry. Results - The association between supply chain management practices and SCP has been completely and partly mediated by SCI. This investigation found that the SCI

completely mediated the interaction between SCP and three SCMPs: information quality, shared vision and objectives, and delay techniques. This study found a considerably important association between information quality and SCP.

Overall, the research indicated that information, system, and service quality are critical elements that influence supply chain effectiveness across different sectors. However, further study is needed to explore the link between these parameters and supply chain performance in Saudi Arabia's manufacturing industry. This research attempts to add to the current knowledge by investigating this link using the DeLone and McLean approach. Following an exhaustive assessment of the literature, the following hypotheses have been developed to direct the investigation in this article:

H₁: *Information quality positively affects supply chain performance.*

H₂: *System quality positively affects supply chain performance.*

H₃: *Service quality positively affects supply chain performance.*

3. Methodology

A quantitative research approach was used in this study to investigate the structural relationship between supply chain performance and information, system, and service quality in manufacturing organizations in Saudi Arabia. A survey questionnaire was created and distributed to 500 employees in the Manufacturing Sector of Saudi Arabia and were selected by the supply chain department as a sample of convenience. 319 valid replies were received from the 500 distributed questionnaires, giving a response rate of 63.8%.

The questionnaire had four components: supply chain performance, information quality, system quality, and service quality. The questions were adapted from prior studies (Al-Rawashdeh et al., 2023; Ali, 2022; Ali, Bakar, et al., 2016; Ali, Omar et al., 2016; Coo & Verma, 2002). The research was evaluated using a Likert scale that is scored with five categories, ranging from 1 (very much disagree) to 5 (very much agree), with 1 being very strong disagreement and 5 representing very strong agreement.

The data was analyzed using a technique called PLS-SEM4, which stands for partial least squares structural equation modelling. The research includes conducting experiments to test hypotheses, analyzing the structural model, and analyzing the reliability and validity of the measurement model.

3.1 Framework of the study

The McLean and DeLone framework is a popular methodology for evaluating the effectiveness of an information system (Ali, Omar, et al., 2016; Setiadi et al., 2023). The six components of the framework are all interrelated and work together to create a whole: system quality, information quality, service quality, utilization, user satisfaction, and net benefits. In the framework, they are all considered vital elements that boost the overall performance of an information system (Ali, Bakar, et al., 2016; Iqbal & Rafiq, 2023).

This study will use the DeLone and McLean framework to determine how information, system, and service quality relate to supply chain efficiency in Saudi Arabia's industrial sector. The supply chain's accuracy, completeness, and timeliness will be assessed by the information quality section. The system quality aspect evaluates how effective, efficient, and helpful the technical systems in the supply chain are. How well a business meets or exceeds its customers' expectations for service is measured by this metric.

The net benefits element of the DeLone and McLean framework will be utilized to assess supply chain performance. Net benefits provide a comprehensive outlook of the effects of the supply chain on the firm, such as better efficiency, lower costs, and more customer satisfaction. Furthermore, user satisfaction and usage aspects will be evaluated in order to establish how often the supply chain management tool is used and how pleased users are with the system.

The DeLone and McLean model presents an extensive framework to assess the effectiveness of information systems; its application to supply chain performance will provide insights into how the quality of information, systems, and services impact supply chain performance in Saudi Arabia's manufacturing industry.
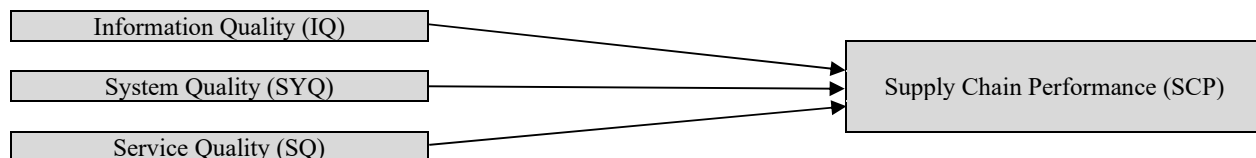

Fig. 1. Framework of the Study

4. Analysis and Discussion

The PLS structural equation can be broken down into two component elements: the measurement model and the structural model. The model's reliability and validity are explained by the measurement model, while the structural model describes the path coefficients between the latent variables. At this point in the research, we are in the interim between two phases. Figure 2 presents the measurement framework that will be used for this investigation.
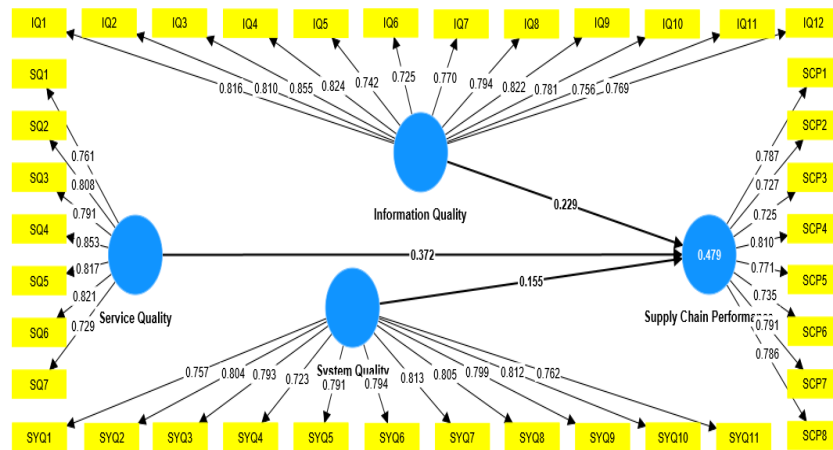

Fig. 2. Measurement Model

4.1 Outer Loadings

The outer loadings in Table 1 show the strong correlation between the observable indicators (questions/items) and the latent variables (constructs). These normalized factor loadings reveal the impact of each signal on its corresponding construct. According to Hair et al. (2014), factor loadings greater than 0.7 are deemed acceptable construct indicators. In this study, we looked at the influence of information, service, and system quality on supply chain performance in Saudi Arabia's manufacturing industry. The primary conclusions from the outer loadings are listed below.

Information Quality (IQ): We used a variety of metrics to examine information quality. All of the metrics, including IQ1 (0.816), IQ2 (0.810), IQ3 (0.855), IQ4 (0.824), IQ5 (0.742), IQ6 (0.725), IQ7 (0.770), IQ8 (0.794), IQ9 (0.822), IQ10 (0.781), IQ11 (0.756), and IQ12 (0.769), show a significant positive relationship with information quality. This implies that the correctness, completeness, and dependability of information substantially contribute to information quality across Saudi Arabia's industrial sector.

Service Quality (SQ): Several indicators were used in our research to assess service quality. SQ1 (0.761), SQ2 (0.808), SQ3 (0.791), SQ4 (0.853), SQ5 (0.817), SQ6 (0.821), and SQ7 (0.729) all have high positive associations with the service quality construct, according to the data. This suggests that service performance elements, such as responsiveness, dependability, and assurance, have a substantial influence on service quality in the manufacturing industry.

Supply Chain Performance (SCP): Several metrics were used to assess supply chain performance. SCP1 (0.787), SCP2 (0.727), SCP3 (0.725), SCP4 (0.810), SCP5 (0.771), SCP6 (0.735), SCP7 (0.791), and SCP8 (0.786) all show significant positive associations with supply chain performance. This shows that aspects linked to service, information, and system quality may be ascribed to better supply chain performance.

System Quality (SYQ): We evaluated system quality as a factor of supply chain performance in our investigation. System quality was strongly related to the markers SYQ1 (0.757), SYQ2 (0.804), SYQ3 (0.793), SYQ4 (0.723), SYQ5 (0.791), SYQ6 (0.794), SYQ7 (0.813), SYQ8 (0.805), SYQ9 (0.799), SYQ10 (0.812), and SYQ11 (0.762). This means that the efficiency, dependability, and effectiveness of systems and technologies used in the industrial sector affect system quality, which in turn influences supply chain performance.

We may deduce from the outer loadings that information, service, and system quality have strong positive relationships with supply chain performance in Saudi Arabia's industrial sector. These results underscore the need to improve supply chain performance outcomes through better information systems, service delivery, and overall system quality.

Table 1
Outer Loadings

	Information Quality	Service Quality	Supply Chain Performance	System Quality
IQ1	0.816			
IQ10	0.781			
IQ11	0.756			
IQ12	0.769			
IQ2	0.810			
IQ3	0.855			
IQ4	0.824			
IQ5	0.742			
IQ6	0.725			
IQ7	0.770			
IQ8	0.794			
IQ9	0.822			
SCP1			0.787	
SCP2			0.727	
SCP3			0.725	
SCP4			0.810	
SCP5			0.771	
SCP6			0.735	
SCP7			0.791	
SCP8			0.786	
SQ1		0.761		
SQ2		0.808		
SQ3		0.791		
SQ4		0.853		
SQ5		0.817		
SQ6		0.821		
SQ7		0.729		
SYQ1				0.757
SYQ10				0.812
SYQ11				0.762
SYQ2				0.804
SYQ3				0.793
SYQ4				0.723
SYQ5				0.791
SYQ6				0.794
SYQ7				0.813
SYQ8				0.805
SYQ9				0.799

4.2 Construct Reliability and Validity

To test the reliability and validity of the measuring scales employed in this investigation (Table 2), we utilized the established criteria proposed by (Hair, Risher, Sarstedt, & Ringle, 2019; Sekaran & Bougie, 2016).

Information Quality: Information quality demonstrated great internal consistency (Cronbach's alpha = 0.945) and high dependability (composite reliability = 0.946). The observed indicators explained a significant part of the variation in the concept (AVE = 0.624), indicating its convergent validity.

Service Quality: Service quality revealed great internal consistency (Cronbach's alpha = 0.905) and high dependability (composite reliability = 0.908). The observed indicators jointly reflected the concept well (AVE = 0.637), demonstrating convergent validity.

Supply Chain Performance: supply chain performance demonstrated great internal consistency (Cronbach's alpha = 0.900) and high reliability (composite reliability = 0.902). The observed indicators explained a significant percentage of the variation in the concept (AVE = 0.588), demonstrating convergent validity.

System Quality: System quality revealed great internal consistency (Cronbach's alpha = 0.938) and high reliability (composite reliability = 0.940). The observed indicators collectively reflected the concept successfully (AVE = 0.619), indicating its convergent validity.

In summary, the measuring scales for information, service, system quality and supply chain performance demonstrated good internal consistency, reliability, and convergent validity, according to the (Hair et al., 2019; Sekaran & Bougie, 2016) criteria.

Table 2
Cronbach's Alpha and Composite Reliability

	Cronbach's Alpha	Composite Reliability	Composite Reliability	Average Variance Extracted
Information Quality	0.945	0.946	0.952	0.624
Service Quality	0.905	0.908	0.924	0.637
Supply Chain Performance	0.900	0.902	0.919	0.588
System Quality	0.938	0.940	0.947	0.619

4.3 Structural Model

In order to carry out a structural equation model (SEM) analysis, the SmartPLS 4 software (Hair et al., 2019) was used in this investigation. The use of PLS in conjunction with SEM makes it possible to investigate the links that exist between the variables in a more complicated model. In this investigation, the supply chain performance variable acts as the dependent variable, while information, service, and system quality are the independent variables. This study evaluates the intricately intertwined causal connections between the latent variables and the observable indicators of those variables by employing SmartPLS 4. In this approach, the measuring model, which defines the connections between the latent variables and their observed indicators, and the structural model, which investigates the links between the latent factors themselves and their influence on the dependent variable, are both evaluated concurrently. The measurement model establishes the relationship between the latent variables and their observed indicators. According to Hair et al. (2019), SmartPLS 4 offers sophisticated analytic capabilities for the assessment and interpretation of models.
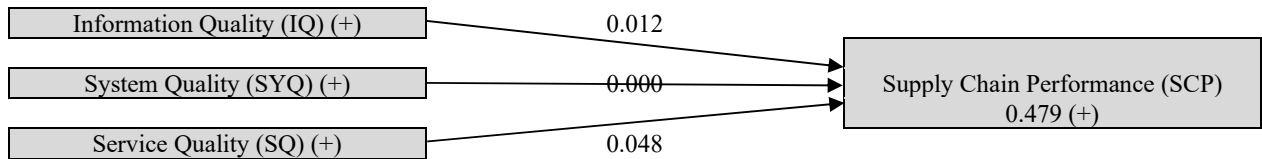

Fig. 3. Structural Model

4.4 Discriminant Validity

Table 3 shows the findings of the discriminant validity analysis, which looks at how dissimilar each concept is from the others across this research. Discriminant validity guarantees that the constructs measure distinct ideas and are not heavily linked.

The correlation coefficients between each pair of constructs are shown in the table. The diagonal cells show the square root of the extracted average variance (AVE) for each construct, which indicates the construct's dependability. The correlation coefficients between the constructions are shown by the off-diagonal cells.

The correlation coefficients between constructs should be less than the square root of the AVE for each concept to prove discriminant validity (Henseler, Ringle, & Sarstedt, 2015). Looking at the table, we can see that the correlation coefficients for each construct are less than the square root of the AVE, showing discriminant validity.

In particular, the correlation between service and information quality is 0.870, which is less than the square root of the AVE for both constructs. Similarly, the correlation between supply chain performance and information quality, supply chain performance and service quality, and system quality and information quality are 0.689, 0.721, and 0.769 respectively. These correlation coefficients are less than the square root of the AVE values in all situations, suggesting discriminant validity.

In summary, the results of the discriminant validity analysis support the distinctness of the information quality, service quality, system quality, and supply chain performance constructs, as Pearson's correlation coefficients for these constructs are smaller than the square root of the AVE values. Overall, the constructs in the study exhibit acceptable discriminant validity based on the provided correlation matrix (Henseler et al., 2015).

Table 3
Discriminant Validity

	Information Quality	Service Quality	Supply Chain Performance	System Quality
Information Quality				
Service Quality	0.870			
Supply Chain Performance	0.689	0.721		
System Quality	0.769	0.694	0.604	

4.5 Path Coefficients

The path coefficients, sample means, standard deviations, T statistics, and p-values for the correlation between information, service and system quality, and supply chain performance are shown in the table.

Supply Chain Performance → Information Quality: The route coefficient between information quality and supply chain performance is 0.229. This means that every unit improvement in information quality corresponds to a 0.229-unit increase in supply chain performance. The sample mean for this relationship is 0.234, indicating similar sample average values for information quality and supply chain performance. The variety of the data points around the mean is shown by the standard deviation of 0.091. As its absolute value exceeds 1.96, the T statistic of 2.500 shows that the path coefficient is statistically significant at a 95% confidence level. The p-value of 0.012, which is smaller than the customary threshold of 0.05, adds to the statistical importance of the link.

Supply Chain Performance → Service Quality: The route coefficient between service quality and supply chain performance is 0.372. This means that every unit improvement in service quality corresponds to a 0.372-unit increase in supply chain performance. The sample mean for this relationship is 0.372, indicating that the sample's average value of service quality is equal to the sample's average value of supply chain performance. The variety of the data points around the mean is shown by the standard deviation of 0.090. As its absolute value exceeds 1.96, the T statistic of 4.149 shows that the path coefficient is statistically significant at a 95% confidence level. Given that the p-value (0.000) is substantially lower than the customary threshold, it demonstrates a high degree of statistical significance.

Supply Chain Performance → System Quality: The route coefficient between system quality and supply chain performance is 0.155. This means that every unit improvement in system quality corresponds to a 0.155-unit increase in supply chain performance. The sample mean for this relationship is 0.152, indicating that the sample's average value of system quality is somewhat lower than the sample's average value for supply chain performance. The variety of the data points around the mean is shown by the standard deviation of 0.079. With an absolute value close to 1.96, the T statistic of 1.978 indicates that the route parameter is marginally significant at a 95% confidence level. The p-value of 0.048, which is less than the customary threshold, demonstrates the statistical significance of the link.

To summarize, the route coefficients represent the intensity and direction of the links between information quality, service quality, system quality, and supply chain performance. T statistics and p-values corroborate the statistical significance of these correlations, demonstrating that information quality and service quality have a greater and more significant impact on supply chain performance than system quality.

Table 4
Coefficients

	Path Coefficient	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P-values
Information Quality →Supply Chain Performance	0.229	0.234	0.091	2.500	0.012
Service Quality → Supply Chain Performance	0.372	0.372	0.090	4.149	0.000
System Quality → Supply Chain Performance	0.155	0.152	0.079	1.978	0.048

4.6 R-square

Table 5 displays the R-squared coefficients for the model of regression that determines supply chain performance.

R-squared: The R-squared value is 0.479, suggesting that the independent variables (information, service, and system quality) explain approximately 47.9% of the variation in supply chain performance.

R-squared adjusted: The corrected R-squared value is 0.473, which takes the model's complexity and sample size into account. It implies that, after accounting for the model's complexity and sample size, the included independent variables may explain about 47.3% of the variation in supply chain performance.

In summary, the R-squared and adjusted R-squared values show that the independent variables (information, service, and system quality) explain a significant portion of the variance (approx. 47.9%) in supply chain performance.

Note: R-squared values give a measure of how good a fit the regression model provides, but it is crucial to examine other aspects and interpret these findings within the context of the research and applicable theoretical considerations.

Table 5
R-square

	R-square	R-square adjusted
Supply Chain Performance	0.479	0.473

5. Discussion and Conclusion

The purpose of this research was to look at the links between information quality, service quality, system quality, and supply chain performance in Saudi Arabia's manufacturing industry. Our results provide useful insights into the elements that impact supply chain performance and emphasize the relevance of information and service quality in obtaining improved supply chain outcomes.

Our findings indicate that there are substantial positive correlations between information quality, service quality, and supply chain performance. This implies that better information and service quality relates to enhanced supply chain performance in Saudi Arabia's industrial sector. These results are consistent with prior studies that highlight the importance of information and service quality in improving supply chain efficiency, responsiveness, and customer satisfaction (Ellitan & Muljani, 2017).

Furthermore, it was shown that, while system quality adds to overall supply chain performance, it is not as impactful as information quality and service quality. This study suggests that firms should prioritize investments in information management systems and service delivery procedures in order to have the greatest influence on supply chain performance.

The assessment scales utilized in this research have good reliability and validity, which gives us confidence in the accuracy and consistency of our results. Cronbach's alpha, composite reliability, and AVE values indicated good internal consistency and convergent validity in consideration of information quality, service quality, system quality, and supply chain performance. These findings suggest that the measuring scales reflect the underlying ideas well and are dependable for future study and practical applications (Hair et al., 2019).

Our research adds to the body of knowledge by bringing to light various aspects that influence supply chain performance in Saudi Arabia's industrial sector. The results emphasize the importance of information and service quality as factors of supply chain performance and customer satisfaction. Investing in information management systems, high-quality service delivery, and regularly monitored and improved supply chain performance will help organizations in this area.

Finally, this research investigated the links between information quality, service quality, system quality, and supply chain performance in Saudi Arabia's manufacturing industry. Our results highlight the significance of information and service quality in achieving excellent supply chain performance. While system quality is important, its influence is rather minor. The findings highlight the need for manufacturing businesses to focus on developing information management systems, providing high-quality services, and continually evaluating and improving supply chain performance.

The study's results add to the current research by giving actual information relevant to Saudi Arabia's industrial sector. The measuring scales utilized in this research have good reliability and validity, which adds to the robustness of the findings. Future studies might expand on the results of this study by researching other factors that impact supply chain performance and possible moderating or mediating variables in order to acquire a better grasp of the underlying dynamics.

Overall, this research offers significant insights for manufacturing practitioners and decision-makers, emphasizing the relevance of information and service quality in attaining improved supply chain performance and increased market competitiveness.

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