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Impact of Quality Management (QM) on Product and Service Delivery in South African Manufacturing Industry

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Abstract

Quality Management (QM) has become a strategic imperative for enhancing operational performance and competitiveness in the manufacturing sector. This study examines the impact of QM practices on product and service delivery within South Africa's manufacturing industry, focusing on key dimensions such as leadership, employee involvement, customer focus, and process management. Using a quantitative cross-sectional survey design, data were collected from 400 professionals, including managers, operators, and quality directors, across Johannesburg-based manufacturing firms. Exploratory Factor Analysis (EFA) and descriptive statistics were employed to analysze the data, revealing four critical factors driving QM success: (1) efficient resource utilization, (2) improved customer satisfaction, (3) enhanced working environments, and (4) increased operational efficiency. The findings indicate that QM implementation significantly reduces waste, improves risk management, and boosts employee consistency, with the highest-ranked impact being greater efficiency (MIS = 4.89). However, challenges such as inconsistent adoption of strategic QM practices and moderate supplier collaboration were identified as barriers to optimal performance. The study contributes to existing literature by providing empirical evidence on QM's role in a developing economy context, while offering actionable insights for industry practitioners. Recommendations include strengthening employee training, fostering customer-centric cultures, and adopting integrated QM frameworks like Lean and Six Sigma. Policymakers are urged to support SMEs in QM certification to enhance sector-wide competitiveness. This research underscores QM as a catalyst for sustainable manufacturing growth in South Africa, aligning with global quality standards while addressing local operational realities.

Keywords
Quality Management (QM), Manufacturing Industry, Operational Efficiency, Customer Satisfaction, South Africa

1. Introduction
Quality management, according to *Maney and Patail (2015),* is concerned with preserving value over time and comprises processes like assurance, planning, and quality control. Adopting these three phases provides the total quality management (TQM) of products and services in the manufacturing business. The manufacturing industry in South Africa often struggle to develop product and service quality that please clients at a fair cost, secure business continuity, and prevent debt *(Carvalho et al., 2019).* To overcome these hurdles and produce high-quality goods and services, a quality management system (QMS) must be implemented, since quality is inherent in satisfying the customers' demands and wants *(White, 2006).* The construction industry in South Africa is encouraged to implement ISO 9001, a widely recognized standard targeted at enhancing quality performance in the production industry. However, with minimal focus on the implications for end-users (customers, clients, etc.), it becomes tough to navigate quality management in the country's manufacturing business (*John and Campbell. 2016).*

In the definition by *Thomas, Gast, Grube, and Craig (2015)* manufacturing companies specialises in transforming resources into semi-processed or consumable items. This is accomplished through various processes across different phases as the industry progresses towards production, processing, and the delivery of goods, products, and services to customers. All of this boils down to one thing, its role in the production process is to increase the value of inputs by creating new ones.

Oakland and Tanner (2006) went ahead to discuss the objective of controlling cost effectively as a functional procedure, that when accurately applied in companies and firms, it will enhance the output of goods and services. *Evans and Lindsay (2007)* further emphasised that by consolidating employee and organisational effectiveness, a company can enhance its capabilities and efficiency, achieving superior quality performance. This, in turn, improves a company's sustainable development, thereby enhancing consumers and stakeholders' satisfaction Understanding that quality is a tool that is essential in satisfying the utility demanded by a customer is directly proportional to putting in measures towards satisfying those needs, with the ever-increasing demand for quality in every sphere of human development, it is postulated that confirmation of satisfaction by the customers on a product is evidence of quality presented by the companies or firms. In reference to this, *Uwadia, Edoun, Pradhan, and Mbohwa (2022)* stated that even though enhanced products and services are demanded highly in the manufacturing industry, company owners and stakeholders should be aware that in order to come close towards achieving this objective, improving employees' performance is germane, and thus must be adopted not only in the manufacturing sector, but also across other sectors of the economy. As expatiated by *Oke, Stephen and Aigbavboa (2022* value management a way of maintaining standard, quality, and product delivery Management in terms of improving quality approach is very important across sectors of the economy, especially in satisfying and expanding the customers' needs and expectations. This approach has been dubbed quality management (QM). In light of the above, this study will assess the impact of quality management (QM) on product and service delivery in South African manufacturing industry.

2. Implementation of TQM in Manufacturing and Service Industries

Around 1980, the TQM philosophy and its tenets were first presented in the United States, mostly in reaction to the fierce competition from Japanese businesses (*Prajogo, 2005).* In the beginning, the manufacturing sector received more attention than the service sector, mostly due to the dominance of scholars in the engineering and operations disciplines *(Khamalah and Lingaraj, 2007).* Following TQM's success in manufacturing, academics and practitioners have begun researching how the concepts and practices of TQM may be applied to the service sector and have proposed that it might be useful there. Although the intangibility, co-production, inseparability, and heterogeneity of service outputs are some of the characteristics that set the service industries apart from the manufacturing industries, these factors may also affect the transfer of TQM principles and practices to the service environment. In contrast, the manufacturing industries have more standardised and measurable specifications *(Prajogo, 2005; Sureshchandar et al., 2001),* which makes it difficult for service providers to control the quality of the service output before delivering it to customers, as is typically done with manufacturing products.

Numerous studies have looked at how the manufacturing and service sectors execute TQM differently. A sample size of 240 enterprises, comprising 130 manufacturing and 110 service organisations, was employed in *Woon's (2000)* study on Singaporean businesses. According to the study, service organisations typically implemented TQM at a lower level than their manufacturing counterparts, especially when it came to information and analysis, process management (PM), and quality performance. However, no discernible difference was discovered in the areas of customer focus, human resources, and leadership. Seven key success factors (CSFs) were found by *Antony et al. (2002)* in their analysis of 17 Hong Kong manufacturing and 15 service enterprises. Training and education (TE), quality data and reporting, management commitment, customer happiness and orientation, the function of the quality department, communication to improve quality, and continuous improvement are the seven CSFs that were determined to be applicable to both sectors. An overview of the effects of TQM in various service industries, including healthcare, banking, food and distribution, education, and Information technology (IT), is given in a study by *Talib and Rahman (2010),* which also highlights the applicability of TQM in these sectors.

The initial implementation of TQM was plagued by rigid hierarchical structures, lack of employee empowerment, and an overemphasis on process compliance rather than continuous improvement, which hindered flexibility and innovation *(Oakland, 2003).* Organisations overcame these challenges through leadership commitment, improved employee involvement, and integration of customer focus into TQM frameworks *(Gonzalea and Guillen, 2002).* At the turn of the new century, the TQM movement reached a mature stage. As it is, TQM is being influenced by Industry 4.0, which is all about optimising the value chain using digital solutions, machine learning, autonomous control, big data analytics, etc. Today, TQM faces new challenges emerging from rapid technological advancements and digital transformations, some of which are lack of highly specialized human resources and issues of data security and protection *(Akhmatova et al. 2022).*

Total Quality Management (TQM) has undergone substantial development and has surpassed its initial limitations in the manufacturing sector to encompass service industries including healthcare, education, hospitality, and financial institutions *(Lakhe and Mohanty, 1995).* The expansion of the service sector has prompted a heightened emphasis on TQM within service-oriented organisations, aiming to deliver top-notch services to their clientele *(Talib, Rehman and Qureshi, 2013).* Initially rooted in the manufacturing domain, studies on TQM practices gradually encompassed the service sector as well *(Gustafsson, Nilsson and Johnson, 2003)*. The evaluation of the effects that TQM practices, such as employee engagement, information analysis, strategic planning, customer-centricity, supplier relations, and process management, have on organizational performance has been the subject of extensive scrutiny *(Taylor and Wright, 2006).*

Leadership

Gonzalea and Guillen (2002) reached the same conclusion that leadership and management commitment are critical for the successful implementation of TQM. The establishment of a work environment that requires the active engagement of every employee in order to achieve the quality objectives of the organization is a critical function of leadership. Furthermore, successful leadership fosters an environment of confidence that enables personnel to surpass their official positions of power and initiate substantial transformations. As a result, the process of improving quality begins with the steadfast dedication of leadership to quality-related undertakings *(Kachru, 2007).* This inspires greater participation and engagement from staff members within the organization in quality-related initiatives.

Employee Involvement

Employee involvement entails granting members of an organisation the authority and opportunity to make decisions and resolve issues pertinent to their role within the organisation. TQM acknowledges the significance of employee involvement in organisational processes. Employee involvement can manifest in various forms such as job participation, teamwork, empowerment, training, and development *(Spector, 1997).* It is indispensable for fostering commitment to quality and achieving favorable outcomes. This suggests that every staff member in an organisation makes a proactive effort to improve the calibre of both products and processes *(Edosmwan, 2002).* In addition, various factors including employee recognition, empowerment, resource allocation, training, and quality consciousness are pivotal in fostering employee engagement *(Abdullah, Halim, Ahmad and Rus, 2008).*

Customer Focus

Customer focus has been highlighted as the primary driver for continual improvement in quality within organisations. Through an extensive review of literature, it was observed that customer focus received the highest level of emphasis. Central to any quality initiative is a focus on the customer. Attaining customer satisfaction is a critical goal of Total Quality Management (TQM). This can be accomplished by means of the organisation's endeavours to design and deliver products and services that are in accordance with the needs and demands of customers *(Cai, 2009).* Customer focus holds paramount importance in TQM as it is the customer who defines the desired quality standard. Consequently, organisations must actively engage with their customers, gather feedback, and analyse this data to discern customer needs and expectations.

Supplier Relations

Supplier relationship management is a process within the supply chain aimed at optimising interactions with suppliers to enhance their value. It encompasses strategic planning and holds significant importance in today's competitive business landscape, where organisations face pressure to enhance quality, performance, responsiveness, and cost-effectiveness. Some organisations achieve these goals by consolidating their supplier base and fostering closer ties with the remaining suppliers. A substantial portion of an organisation's non-conformances stems from defective incoming materials and resources, underscoring the critical role of the supplier-buyer relationship in the quality improvement process. Consequently, many organisations are adopting Supplier Relationship Management (SRM) practices to cultivate enduring partnerships with suppliers *(Park, Shin, Chang and Park, 2010).*

Strategic Planning

Strategic management is a continuous procedure that evaluates market dynamics and competitors to establish objectives and devise strategies aligned with customer requirements. It holds a pivotal position in implementing Total Quality Management (TQM) by identifying and assimilating TQM goals into strategic frameworks. Strategic planning is instrumental in crafting and executing strategies aimed at enhancing both customer and employee contentment *(Treiman, 2009).*

Process Management

Total Quality Management (TQM) prioritises customer satisfaction and centers on organising processes effectively. Its objective is to elevate the quality of products through refining the processes involved in their production or service delivery. Processes encompass identifying necessary tasks to reach objectives, delegating responsibilities, and structuring decision-making frameworks within an organisation. When processes are implemented correctly, they foster a productive and streamlined work atmosphere where employees fulfill tasks to attain goals. Process management further entails scrutinising and enhancing interdisciplinary tasks across the organisation *(Oakland, 2003).*

Information Analysis

Improving product and service quality is an objective for many organisations, and for some, achieving outstanding quality has become a strategic intent *(Liedtke et al., 2010*). Simply gathering data isn't enough. Organisations must ensure that their information systems are accurate, user-friendly, safe, and available to relevant personnel. This facilitates informed decision-making by managers. Businesses that consistently gather and assess data tend to outperform those that do not. Nonetheless, a significant hurdle is managing the escalating volume and reliability of information *(Lee and Lee, 2014).* In order to make quality performance visible, quality scorecards and dashboards are now widespread in organisations. Technological advancements in real-time data collecting and display have made this task easier. The field of information management has changed due to the fast development of data collecting and analysis skills made possible by IT *(Evans & Wurster, 2000).* The media and literature have frequently referenced various examples of big data applications in fields such as public health, astronomy, and airline ticket pricing *(Davenport, 2014; Mayer-Schonberger & Cukier, 2013).* Companies like Amazon, Facebook, and Google use advanced analytics and big data approaches in their day-to-day operations *(Stone, 2013; Schmidt & Rosenberg, 2014).*

Organisational Performance

By effectively integrating TQM principles, organisations can attain a multitude of benefits, such as cost reduction, improved quality of products or services, expanded market presence, and heightened consumer contentment. Effective leadership and employee participation were identified by *Yusof and Aspinwell (2000)* as TQM practices that exhibited a positive correlation with enhanced organisational performance.

3. Impact of TQM on Organisational Performance, Competitive Advantage and Excellence

The effect of implementing Total Quality Management (TQM) on the performance of organisations has been the subject of extensive research. *Powell (1995)* conducted 15 hypothetical analyses using various variables and discovered that firms implementing TQM enjoyed a competitive advantage over non-TQM firms. However, as noted by *Brah, Wong and Rao (2000),* growth and improvement in firms are not always directly attributable to the adoption of TQM. A hypothetical analysis conducted by *Terziovski and Samson (1999)* posits that Total Quality Management (TQM) and organisational performance are positively correlated. TQM influences operational performance, employee and consumer relations, and satisfaction in a positive way. Despite this, this effect varies among the various categories of businesses examined. Organisations can improve customer satisfaction and employee relations, which are essential indicators of business growth, through the implementation of TQM.

4. Research Methodology

This study employed a quantitative cross-sectional survey design to investigate the impact of Quality Management Systems (QMS) on South Africa's manufacturing sector. The research utilised structured questionnaires to collect primary data, supplemented by secondary sources such as journals, industry reports, and archived materials. The study was geographically centred in Johannesburg due to its prominence in manufacturing activities and accessibility to relevant professionals. The target population included approximately 400 individuals such as managers, operators, and labourers directly involved in quality management. A census sampling method was adopted, and data collection was conducted in two stages while observing COVID-19 regulations. A pilot study, as recommended by *Majid et al. (2017),* was carried out to refine the questionnaire, identify ambiguities, and improve question clarity. The questionnaire, divided into five sections, focused on driving factors, impacts, barriers, and benefits of QMS in the delivery of products and services. Data collection occurred between June and November 2023 using online surveys for safety and reach. For analysis, a five-point Likert scale was employed, and the mean item score (MIS) was calculated using a specific equation to rank responses. Exploratory Factor Analysis (EFA) was applied to distil patterns among variables and understand correlations *(Pallant, 2011; Yong and Pearce, 2013).* Key EFA techniques included the Kaiser-Meyer-Olkin test, Bartlett's test, pattern matrices, and scree plots. To ensure the integrity of findings, emphasis was placed on reliability and validity, with employee involvement being highlighted as essential to the success of QMS implementation *(Birolini and Birolini, 2017; Moodliyar, 2008).*

5. Findings

The demographic analysis of respondents reveals varied educational backgrounds, age groups, and professional affiliations within the manufacturing industry. The majority of respondents hold a bachelor's degree (20.5%), closely followed by those with honours (20%) and master's degrees (19.5%). A smaller proportion possess either a doctorate or a post-matric certificate (13.3% each), while 11.9% have a professional degree and only 1.4% hold a national vocational certificate. Regarding age distribution, the largest group falls within the 35–49 years range (33.8%), followed closely by those aged 50–70 years (32.9%). Younger participants aged 25–34 and 18–24 account for 19.5% and 12.4% respectively, with a minimal number aged 76 (1%) and 82 (0.5%) years. In terms of job affiliation, the respondents held various positions in the manufacturing sector, with operators making up the largest group at 15.2%, followed by quality management directors (14.3%), supervisors (12.9%), and processing workers (12.4%). General labourers and managers each comprised 11.9%, material handlers 11.4%, and assemblers 10%. The work experience of respondents also varied, with 26.7% having 6–10 years of experience, and 19.5% having 1–5 years. Additionally, 16.7% had 11–15 years, 14.3% had over 20 years, 13.8% had 16–20 years, while only 9% had less than one year of experience in the manufacturing industry.

Descriptive analysis for impacts of QM application

The findings of the descriptive analysis are displayed in Table 1, which comprises the ranking of the variables, the mean item score (MIS), and the standard deviation (SD). On a five-point Likert scale, the participants rated the impacts as follows: 1 (Strongly disagree), 2 (Disagree), 3 (Neutral), 4 (Agree), and 5 (Strongly agree). The results indicate that the impacts were ranked as follows: 'create greater efficiency and less waste' was ranked first with a MIS of 4.89 and SD of 0.313; 'improve risk management' was ranked second with a MIS of 4.80 and SD of 0.397; 'enhance employee task consistency' was ranked third with a MIS of 4.69 and SD of 0.495; 'increase customer satisfaction' was ranked fourth with a MIS of 4.68 and SD of 0.467; and 'optimise and maintain major business processes' was ranked fifth with a MIS of 4.62 and SD of 0 The respondents ranked "product & service conformance to customer specifications is relatively high" sixth with a mean error of 4.61 and a standard deviation of 0.499; "improve the use of time and other resources" seventh with a mean error of 4.59 and a standard deviation of 0.503; "production volume flexibility (increase & decrease volume) eighth with a mean error of 4.56 and a standard deviation of 0.507; "enhance employee participation" ninth with a mean error of 4.55 and a standard deviation of 0.508; and "create better understanding" The respondents ranked 'regulation of successful working practices' thirteenth with a MIS of 4.48 and SD of 0.529, 'delivery reliability of products and services' twelfth with a MIS of 4.49 and SD of 0.501, and 'lead time to introduce new products delivery' lowest with a MIS of 4.43 and SD of 0.497.

Table 1: Descriptive Analysis for Impacts of QMS Application

Codes	Impacts	Mean	Std. Deviation	Rank
IQA1	Create greater efficiency and less waste	4.89	0.313	1
IQA2	Improve risk management	4.80	0.397	2
IQA3	Achieve greater consistency in task by employee	4.69	0.495	3
IQA4	Increase customer satisfaction	4.68	0.467	4
IQA5	Better and consistent control of major business process	4.62	0.497	5
IQA6	Product & service conformance to customer specification is relatively high	4.61	0.499	6
IQA7	Improve the use of time and other resources	4.59	0.503	7

IQA8	Production volume flexibility (increase & decrease volume)	4.56	0.507	8
IQA9	Improved participation of employees	4.55	0.508	9
IQA10	Create better understanding of customer need	4.54	0.499	10
IQA11	Response to change in delivery due date	4.54	0.509	10
IQA12	Delivery reliability of products and services	4.49	0.501	12
IQA13	Regulation of successful working practices	4.48	0.529	13
IQA14	Lead time to introduce new products delivery	4.43	0.497	14

Exploratory factor analysis for impacts of QM application

All the identified impacts of QM application were subjected to Exploratory Factor Analysis (EFA). The evaluation of data applicability for exploratory factor analysis was conducted through an examination of the correlation matrix. The outcome demonstrates that coefficient values equal to or greater than 0.3 are appropriate for the factor analysis, as illustrated in Table 2.

Table 2: Correlation Matrix for Impacts of QMS Application

	IQA1	IQA2	IQA3	IQA4	IQA5	IQA6	IQA7	IQA8	IQA9	IQA10	IQA11	IQA12	IQA13	IQA14
IQA1	**1.000**													
IQA2	0.289	**1.000**												
IQA3	-0.116	0.276	**1.000**											
IQA4	0.131	0.003	0.197	**1.000**										
IQA5	0.030	-0.030	-0.006	0.084	**1.000**									
IQA6	0.060	0.016	-0.064	-0.046	0.150	**1.000**								
IQA7	0.111	0.205	0.174	-0.111	-0.043	0.289	**1.000**							
IQA8	0.148	0.191	0.170	-0.017	-0.079	0.129	0.424	**1.000**						
IQA9	0.071	0.072	0.077	0.048	0.076	0.012	0.122	0.269	**1.000**					
IQA10	0.045	0.030	0.066	0.135	0.185	0.094	-0.056	-0.020	0.238	**1.000**				
IQA11	0.054	0.075	0.134	0.242	0.042	0.101	0.061	0.074	0.061	0.438	**1.000**			
IQA12	0.031	0.096	0.092	0.157	0.242	0.153	0.138	0.115	0.040	0.087	0.264	**1.000**		
IQA13	0.045	0.192	0.246	0.146	0.090	0.069	0.151	0.204	0.109	-0.034	0.005	0.382	**1.000**	
IQA14	-0.007	0.051	0.153	0.065	0.128	0.087	0.142	0.116	0.181	-0.081	-0.063	0.198	0.454	**1.000**

Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were employed to determine whether the data were appropriate for exploratory factor analysis. As stated *by Field (2013) and Williams (2011),* the minimum value of KMO is 0.6, and the significance level for Bartlett's test of sphericity is 0.05. The outcomes of this survey, as presented in Table 3, indicated that the KMO and Bartlett's tests of sphericity yielded values of 0.835 and 0.000, respectively. This suggests the feasibility of conducting EFA.

Table 3: KMO and Bartlett's Test for Impacts of QMS Application

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.835
Bartlett's Test of Sphericity	Approx. Chi-Square	412.607
	Df	91
	Sig.	0.000

Table 4 shows the communalities for the fourteen (14) variables, with a minimum extraction value of 0.3. From the Table, it can be seen that all 14 variables are above the required value of 0.3. Hence, the inclusion of the total variable for EFA.

Table 4: Communalities for Impacts of QMS Application

Impacts	**Initial**	**Extraction**
Create greater efficiency and less waste	1.000	0.848
Improve risk management	1.000	0.572
Better and consistent control of major business process	1.000	0.672
Delivery reliability of products and services	1.000	0.501
Lead time to introduce new products delivery	1.000	0.521
Regulation of successful working practices	1.000	0.643
Improved participation of employees	1.000	0.683
Production volume flexibility (increase & decrease volume)	1.000	0.592
Response to change in delivery due date	1.000	0.827
Create better understanding of customer need	1.000	0.699
Increase customer satisfaction	1.000	0.703
Product & service conformance to customer specification is relatively high	1.000	0.588
Improve the use of time and other resources	1.000	0.668
Achieve greater consistency in task by employee	1.000	0.637
Extraction Method: Principal Component Analysis.		

After confirming the suitability of the dataset, it underwent exploratory factor analysis, extracting eigenvalues greater than 1 for the impacts of QM application, in line with Kaiser's criterion, which involves retaining factors with eigenvalues above 1.0. As indicated in Table 5, six factors fulfilled this criterion, with eigenvalues of 2.501, 1.694, 1.447, 1.308, 1.126, and 1.077. The respective variance for the retained eigenvalues were 17.863%, 12.097%, 10.334%, 9.342%, 8.040%, and 7.695%. These six factors collectively explain 65.371% of the total variance, surpassing Stern's (2010) suggested threshold of 50%.

Table 5: Total Variance Explained for Impacts of QMS Application

S/N	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	2.501	17.863	17.863	2.501	17.863	17.863	1.922	13.726	13.726
2	1.694	12.097	29.960	1.694	12.097	29.960	1.743	12.450	26.176
3	1.447	10.334	40.293	1.447	10.334	40.293	1.616	11.541	37.717
4	1.308	9.342	49.635	1.308	9.342	49.635	1.346	9.613	47.330
5	1.126	8.040	57.675	1.126	8.040	57.675	1.333	9.519	56.849
6	1.077	7.695	65.371	1.077	7.695	65.371	1.193	8.522	65.371
7	0.890	6.354	71.725						
8	0.787	5.621	77.345						
9	0.729	5.207	82.552						
10	0.580	4.145	86.697						
11	0.538	3.844	90.541						
12	0.490	3.497	94.038						
13	0.440	3.142	97.180						
14	0.395	2.820	100.000						
Extraction Method: Principal Component Analysis.									

Similarly, Figure 1 illustrates the scree plot, depicting eigenvalues plotted against component numbers. Observing the graph, with each increment in the component number, the line gradually tilts downward towards the bottom of the horizontal axis (component number). This trend arises due to each subsequent factor explaining a diminishing portion of the total variance. Further examination discerned that only six factors merit retention, as evidenced by a noticeable shift in the plot's trajectory at the sixth factor.

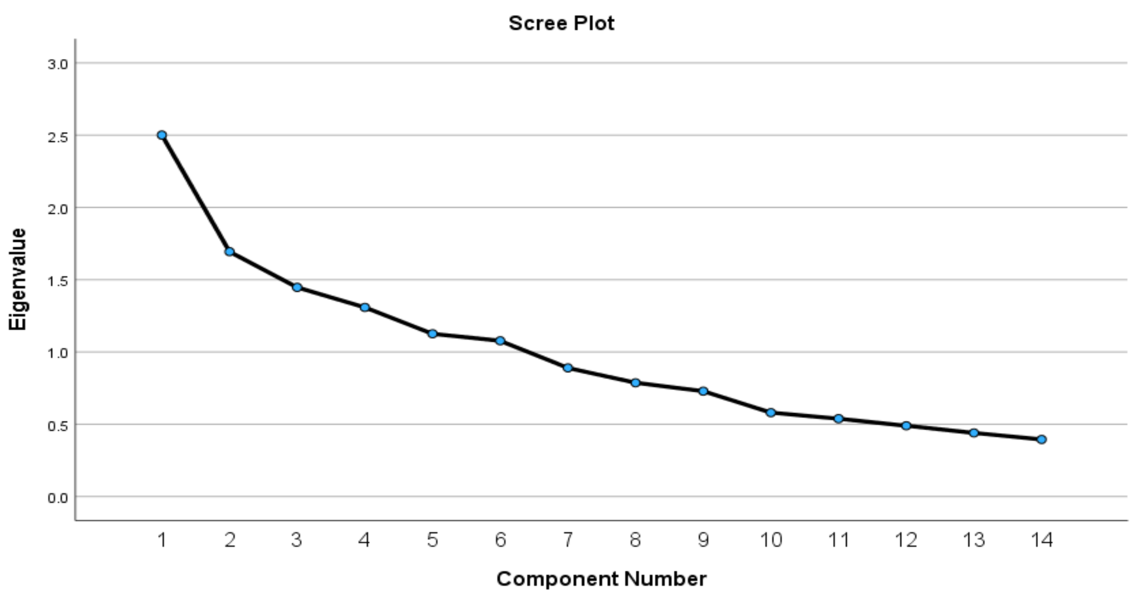

Figure 1: Scree Plot for Impacts of QMS Application

Table 6 presents the extracted pattern matrix, which provides information on the loading values of the impacts and the corresponding loading variables. The pattern matrix, comprising fourteen variables identified from the literature and factored into six clusters via varimax rotation, is presented in the table. According to *Kline (2014),* a component earns a name when two or more variables are grouped within it. Consequently, these components are omitted, leading to a reduction in the total components to four (4), as demonstrated in Table 4.16.

Table 6: Extracted Pattern Matrix for Impacts of QMS Application

Impacts of QMS Application	**Components**			
	1	2	3	4
Efficient use of resources				
Improve the use of time and other resources	0.783			
Achieve greater consistency in task by employee	0.721			
Product & service conformance to customer specification is relatively high	0.613			
Lead time to introduce new products delivery	0.406			
Improved customer satisfaction				
Increase customer satisfaction		0.820		
Create better understanding of customer need		0.750		
Delivery reliability of products and services		0.426		
Improved working environment				
Improved participation of employees			0.787	
Regulation of successful working practices			0.641	
Production volume flexibility (increase & decrease volume)			0.577	
Improved work efficiency				
Create greater efficiency and less waste				0.887
Improve risk management				0.635
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalisation.a				
a. Rotation converged in 9 iterations.				

Table 6 shows the pattern matrix of the variables which were achieved through varimax rotation. The four extracted components were named in relation to internal coherent that exists on the clustered variables. The given names are:

1. The first extracted principal factor which accounts for 17.863% of the total variance, contains four variables which includes 'Improve the use of time and other resources' (78.3%), 'Achieve greater consistency in task by employee' (72.1%), 'Product & service conformance to customer specification is relatively high' (61.3%), and 'Lead time to introduce new products delivery' (40.6%). This factor was subsequently named ***Efficient use of resources*** due to the similarity in the variables.
2. Loaded in factor 2 are three variables which are 'Increase customer satisfaction' (82%), 'Create better understanding of customer need' (75%), and 'Delivery reliability of products and services' (42.6%). Accounting for 12.097% of the total variance, this factor was labelled ***Improved customer satisfaction.***
3. The third factor explains 10.334% of the total variance and has three variables which includes 'Improved participation of employees' (78.7%), 'Regulation of successful working practices' (64.1%) and 'Production volume flexibility (increase & decrease volume)' (57.7%). This factor was named ***Improved working environment.***
4. Loaded in factor four are two variables which explains 8.040% of the variance. These variables are 'Create greater efficiency and less waste' (88.7%), and 'Improve risk management' (63.5%). They were subsequently named ***Improved work efficiency.***

The component correlation matrix displayed in Table 7 illustrates the connections within the extracted four principal factors. Positive values signify a strong relationship, whereas negative values denote a weak association among the factors.

Table 7: Component Transformation Matrix for Impacts of QMS

Component	1	2	3	4	5	6
1	0.675	0.364	0.452	0.207	0.316	0.254
2	-0.040	0.855	-0.430	-0.271	-0.094	-0.019
3	-0.723	0.261	0.443	0.069	0.416	0.186
4	0.121	-0.126	-0.204	-0.327	0.772	-0.473
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalisation.						

Research has indicated that quality management (QM) can yield substantial enhancements in employment, management practices, sales, and business operations *(Vecchi and Brennan, 2011)*. According to the literature review, among the effects of implementing QM in an organisation are enhanced employee engagement and participation in quality initiatives, as well as improvements in the quality of processes and products *(Edosmwan, 2002)*. Prior research additionally showed the following benefits of implementing a QMS in an organisation: the provision of products and services that fulfil customer requirements; enhanced quality, performance, responsiveness, and cost reduction; and increased employee and customer satisfaction *(Cai, 2009; Treiman, 2009)*. This supports the findings obtained in this research. In addition, QM applications improve the manufacturing and service processes associated with products, foster an effective and efficient work environment in which employees carry out tasks to attain objectives, assist managers in making well-informed decisions, yield numerous advantages including reduced costs, enhanced product or service quality, increased market share, satisfied customers, and overall improved organisational performance *(Lee et al. 2012; Oakland, 2003; Yusof and Aspinwell, 2000)*.

6. Conclusion and Recommendation

The findings of this study demonstrate the significant role quality management plays in enhancing operational performance within South Africa's manufacturing sector. By examining key dimensions of quality management systems, the research reveals measurable improvements in efficiency, risk mitigation, workforce performance, and customer satisfaction levels. These outcomes align with established quality management principles while reflecting the unique operational context of South African manufacturers. Analysis of the data identified four primary areas where quality management creates value: optimizing resource utilization, elevating customer satisfaction metrics, improving workplace dynamics, and streamlining operational processes. The results particularly highlight how leadership commitment and workforce engagement serve as foundational elements for successful quality management implementation. However, the study also notes uneven adoption across organizations and opportunities to strengthen strategic quality planning and supplier quality management practices.

For manufacturing enterprises, the study recommends prioritizing workforce development programs to build quality management competencies across all organizational levels. Implementing structured feedback mechanisms with customers and suppliers would further enhance quality alignment with market requirements. Process improvement methodologies such as Lean and Six Sigma should be more widely adopted to drive continuous improvement. Industry associations and government entities can support these efforts by developing targeted quality management initiatives for small and medium manufacturers, including subsidized training and certification programs. Establishing sector-specific quality benchmarks would help raise standards across priority industries. Future research should explore regional variations in quality management adoption and investigate the long-term financial impacts of quality management systems on organizational performance.

The consistent application of quality management principles offers South African manufacturers a pathway to strengthen their competitive position both domestically and in global markets. By addressing current gaps in quality management implementation and fostering a culture of continuous improvement, the sector can achieve sustainable growth while meeting evolving customer expectations and regulatory requirements. The findings underscore quality management as not just an operational tool, but a strategic imperative for the future of South African manufacturing.

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