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Elementos del Proceso de Control para la Gestión de Calidad en Empresas del Sector Petroquímico

Elements of the Control Process for Quality Management in Companies in the Petrochemical Sector

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Resumen

Se identificaron los elementos del proceso de control para el fortalecimiento de la gestión de la calidad en las empresas del sector petroquímico. Trabajo con enfoque cuantitativo, tipo explicativo, se considera de campo con diseño no experimental, transaccional. La muestra intencional fue de 16 gerentes de diferentes empresas Petroquímicas que estuvieran involucrados con los procesos organizacionales de áreas administrativas. Se empleó la técnica de observación mediante encuesta, el cuestionario aplicado tiene ítems con opciones de respuestas múltiples por cinco (5) alternativas, así: Siempre; Casi Siempre; A veces, Casi nunca, y Nunca. Los resultados revelan que casi siempre se aprovechan las ventajas de la transformación digital porque se toma en cuenta la experiencia del cliente, la Eficiencia, se analizan los datos, y existe captación, conversión y fidelización, que se aprovechan las ventajas de la transformación digital por lo cual a la gerencia se le hace indiferente la puesta en práctica. Estos hallazgos están alineados con las recomendaciones de la literatura sobre la importancia de la aplicación constante de herramientas de calidad y la integración de tecnologías digitales.

Palabras claves: Gestión de Calidad, Industria petroquímica, Procesos de control, Sistemas administrativos.

Abstract

The elements of the control process for strengthening quality management in petrochemical companies were identified. Work with a quantitative approach, explanatory type, is considered field with non-experimental, transactional design. The intentional sample was 16 managers from different petrochemical companies who were involved with the organizational processes of administrative areas. The observation technique through a survey was used, the applied questionnaire has items with multiple response options for five (5) alternatives, as follows: Always; Almost Always; Sometimes, Almost Never, and Never. The results reveal that the advantages of digital transformation are almost always taken advantage of because customer

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experience, efficiency, data are analyzed, and there is capture, conversion and loyalty, that the advantages of digital transformation are taken advantage of, which is why management is indifferent to its implementation. These findings are aligned with the recommendations of the literature on the importance of the constant application of quality tools and the integration of digital technologies.

Key words: Quality Management, Petrochemical Industry, Control Processes, Administrative Systems.

1. Introduction

Quality management in petrochemical companies is a crucial aspect that directly influences operational efficiency, safety and competitiveness in a highly demanding global market (Wardhani, 2022). In this context, the control process for quality management is configured as a comprehensive set of elements aimed at ensuring that products and processes meet pre-established standards and satisfy customer expectations (Coelho et al., 2023).

The elements of the quality management control process are ideal mechanisms to ensure the deployment of corporate policies and accompany the development of plans, which is a necessity as the complexity of the company grows. in order to achieve the organization's objectives (Jianguo, 2022). Additionally, they are a key way to provide feedback on quality, strategic plans, among others (Lehyani et al., 2023). They are more important if their response time is very short, since this allows corrections or adjustments to be made at the right time.(Yousef et al., 2024). Management elements are also data through which the performance of a company's administration is appreciated and evaluated (Barrios, 2024).

In the same sense, they are ideal mechanisms to guarantee the deployment of corporate policies and accompany the development of plans, which is a necessity as the complexity of the company grows (Doulabi et al., 2022). Management elements offer companies a competitive advantage over organizations producing the same goods, thus identifying their strengths and weaknesses to take appropriate corrective measures (García, 2024). Thus, the management functions seek to assess and monitor the execution in terms of achieving specific objectives or carrying out specific tasks or activities. In the organizational context, the indicators are the existing ones and the comparative analyses (Mehrabioun et al., 2022).

Analyzing existing quality indicators are measurement instruments that organizations use to evaluate the quality of their products and services (Trinidad et al., 2023). They are essential tools that maintain quality standards in all business processes (Quality indicators are essential to maintain the organization's predetermined quality levels during the development of a product (Pingo et al., 2020).

Comparative analysis, in turn, involves analyzing and synthesizing the similarities, differences, and patterns of two or more cases that share a common focus or goal (Sánchez, 2020). To do this correctly, the specific characteristics of each case must be described in depth at the beginning of the study. According to Torres et al. (2018), and it is interesting to note that comparative analyses with the essential components of total quality are: principles, models and improvement methodologies. The principles are universal concepts on which the different total quality models are based; these are invaluable tools for organizations that wish to apply the aforementioned principles.

The principles are universal concepts on which the different total quality models are based; these are invaluable tools for organizations that wish to apply them (D'anjour et al., 2023).In summary and following what was established by Kosasih et al. (2024) and Gwangwazo & Muazu (2021), the control process for quality management not only seeks to comply with regulatory standards and satisfy customer expectations, but also promotes a culture of continuous improvement and operational excellence. This systematic and proactive approach is essential to face the challenges of the sector and achieve a sustainable competitive advantage. For all the reasons stated here, in this work the elements of the control process for strengthening quality management in companies in the petrochemical sector were identified.

3. Methodology

The work is framed under the positivist paradigm, with a quantitative approach, the research methodologically responds to an explanatory type study and according to the source that originates the information, it is considered a field study with a non-experimental, transactional or transversal design. (Rosado et al., 2024). The universe of the study is made up of companies in the Petrochemical sector of the state of Zulia in Venezuela, such as: POLINTER, PEQUIVEN, PRALCA and PROPILVEN. However, it is noted that the analysis units to be considered for the study were the Managers of different areas of each of the companies mentioned, see Table 1.

Table 1. Characteristics of the population under study

Companies	Managements	Post	Total
POLINTER	· General Management	Managers	10
	· Manufacturing Management		
	· Administration and Finance Management		
	· AIT Management		
	· SSGG Management		
	· DDSS Management		
PEQUIVEN	· General Management	Managers	15
	· Manufacturing Management		
	· Administration and Finance Management		
	· AIT Management		
	· SSGG Management		
	· DDSS Management		
PRALCA	· General Management	Managers	6
	· Manufacturing Management		
	· Administration and Finance Management		
	· AIT Management		
	· SSGG Management		
	· DDSS Management		
PROPYLVEN	· General Management	Managers	6
	· Manufacturing Management		
	· Administration and Finance Management		
	· AIT Management		
	· SSGG Management		
	· DDSS Management		
	Total		37

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The analysis units of the study can be seen, from the different petrochemical companies considered for investigation, there are 37 Managers, but the intentional sample was 16, which were chosen based on pre-established criteria or judgments, such as:

(a) The time available for the Managers to respond to the instrument was considered.
(b) Managers who were involved in the day-to-day organizational processes of the Petrochemicals in administrative areas, directly linked to Quality Management, were assumed.
(c) Managers who held permanent, non-contracted positions;
(d) That they have in-depth administrative/managerial knowledge of petrochemical companies.
(e) Managers who had further of two (2) years in office or professional practice.
(f) Managers who are not on vacation or sick leave.

The observation technique was used through a survey, the applied questionnaire has items with multiple response options for five (5) alternatives, as follows: Always (S=5); Almost Always (CS=4); Sometimes (AV=3) Almost Never (CN=2) and Never (N=1). The statistical treatmentof the same nature,similar to that of Severiche et al. (2023) and Severiche et al. (2021), characterized by obtaining a global view of the entire data set by estimating the frequency distribution, which resulted in the calculation of the absolute (fa) and relative (%) frequencies of the projected responses per sample addressed.

In Table 2, it is important to highlight that the scores obtained after calculating the arithmetic means of the items processed when applying the instrument, will determine the weighting of the value of the response alternatives that will allow the variables to be placed in the categories, Very high application (4.2-5.00); High application (3.2-4.00); Medium application (2.5-3.25); low application (1.76-2.50); Very low application (1.00-1.75).

Table 2. Scale for the arithmetic mean or average

Alternatives	Range	Categories
Always	4.20 – 5.00	**Very High**
Almost always	3.40 – 4.19	**High**
Sometimes	2.60 – 3.39	**Average**
Hardly ever	1.80 – 2.59	**Low**
Never	**1.00 – 1.79**	**Very low**

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4. Results and discussion

Table 3 shows the questions that were applied to existing indicators managed by the organization. It was found that 56% of the population stated that they always, 19% almost always, 19% sometimes, 6%

almost never, and 0% never. Currently, they know the existing indicators managed by the management where they work.

Table 3. Existing indicators

You currently know the existing indicators that the organization manages.												
Location of the subjects surveyed	Responses obtained											
	S		CS		av		CN		N			
	9	56%	3	19%	3	19%	1	6%	0	0%		
Subtotal	9	56%	3	19%	3	19%	1	6%	0	0%		
Currently you know the existing indicators that the management where you work handles.												
Location of the subjects surveyed	Responses obtained											
	S		CS		av		CN		N			
	9	56%	5	31%	2	13%	0	0%	0	0%		
Subtotal	9	56%	5	31%	2	13%	0	0%	0	0%		
Would you like to know the existing indicators through digital applications?												
Location of the subjects surveyed	Responses obtained											
	S		CS		av		CN		N			
	13	81%	3	19%	0	0%	0	0%	0	0%		
Subtotal	13	81%	3	19%	0	0%	0	0%	0	0%		
Total	31	64%	11	23%	5	11%	1	2%	0	0%		

Fountain: Authors

It was found that 56% of the population said that they always, 31% almost always, 13% sometimes, 0% almost never and 0% never. And in relation, they would like to know the existing indicators through digital applications. It was found that 81% of the population said that they always, 19% almost always, 0% sometimes, 0% almost never and 0% answered never.

The results obtained indicate a high frequency in the use of quality control tools, which is consistent with the recommendations in the literature on the importance of a constant implementation of these practices to maintain high quality standards. According to Lehyani et al (2023), effectiveness in quality control is achieved when the tools are used systematically and continuously. This high degree of use observed in the survey (87% using tools "always" or "almost always") supports this recommendation.

However, the presence of the 13% who use the tools "sometimes" may be an area of concern. According to Heyns & Boikanyo (2019) variability in the application of quality control tools can lead to inconsistencies in results and product quality.

This suggests that additional strategies could be implemented to standardize the use of these tools and ensure their application in all relevant processes. The high interest in using digital applications to access quality indicators is consistent with the growing trend towards digitalisation in quality management. Research by Alofi & Younes (2019) points out that digitalisation improves data accessibility and analysis, facilitating more informed and real-time decision making. The preference for digital solutions

reflected in the 81% “always” interest suggests that organisations are aligned with this trend.

For its part, in Table 4, when analyzing the responses related to comparative analysis, it could be observed that the organization shows the comparative analysis of previous administrations with the current ones.

Table 4. Comparative analysis

The organization shows the comparative analysis of previous and current management.												
Location of the subjects surveyed	Responses obtained											
	S		CS		av		CN		N			
	5	31 %	3	19 %	7	44 %	1	6 %	0	0 %		
Subtotal	5	31 %	3	19 %	7	44 %	1	6 %	0	0 %		
Do you believe that the organization's processes should be improved according to your experience?												
Location of the subjects surveyed	Responses obtained											
	S		CS		av		CN		N			
	9	56 %	3	19 %	7	44 %	1	6 %	0	0 %		
Subtotal	9	56 %	3	19 %	7	44 %	1	6 %	0	0 %		
The Company makes decisions through predictive analytics, based on quality management												
Location of the subjects surveyed	Responses obtained											
	S		CS		av		CN		N			
	5	31 %	6	38 %	4	25 %	0	0 %	1	6 %		
Subtotal	5	31 %	6	38 %	4	25 %	0	0 %	1	6 %		
Total	19	39 %	13	27 %	13	27 %	2	4 %	2	2 %		

Fountain: Authors

Finding that 31% of the population stated that always, 19% almost always, 44% sometimes, 6% almost never and 0% never believe that the organization's processes should be improved according to your experience. Finding that 56% of the population stated that always, 25% almost always, 13% sometimes, 6% almost never and 0% never. And in relation to the company, decisions are made through predictive analytics, based on quality management. Finding that 31% of the population stated that always, 27% almost always, 27% sometimes, 4% almost never and 6% never.

These results indicate a mixed perception regarding the need to improve processes. The fact that 31% consider that improvements should be made “always” and 19% “almost always” suggests that a significant part of the population is convinced of the need for continuous improvement. This is in line with the concept of continuous improvement promoted by authors Jawad & Ledwith, (2022), who argue that the constant search for improvements is crucial to maintaining competitiveness and operational

effectiveness.

The 44% who answered “sometimes” reflect a more ambivalent view. This may be related to a perception that current processes are mostly effective, but could benefit from sporadic adjustments. The literature suggests that resistance to change and a lack of a culture of continuous improvement may contribute to this ambivalence (Hassan & Jaaron, 2021). In contrast, the low percentage of “almost never” and “never” responses indicates that most employees recognize some degree of need for improvement, although not all see this as a constant priority.

The results show a high variability in the use of predictive analytics. The combination of “always” and “almost always” responses (58%) indicates a relatively frequent use of this tool, but the 27% who use it “sometimes” suggests that it is not fully integrated into all quality-related decisions. This is in line with the literature which points out that although predictive analytics has great potential to improve decision-making, its full adoption may be limited by the lack of adequate infrastructure or analytical skills (Aghaee et al., 2021).

5. Conclusion

The results reveal that the advantages of digital transformation are almost always taken advantage of because customer experience and efficiency are taken into account, data is analyzed, and there is acquisition, conversion and loyalty, which makes the advantages of digital transformation so that management is indifferent to its implementation. These findings are aligned with recommendations from the literature on the importance of consistent application of quality tools and integration of digital technologies. However, the identified areas for improvement need to be addressed to ensure consistent and effective implementation of quality tools and to fully exploit the potential of digital technologies. The organization should consider implementing strategies to integrate predictive analytics into all areas of quality-related decision-making, thereby improving the ability to anticipate problems and optimize processes.

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