

A STUDY ON EFFECTIVENESS OF DIGITAL QUALITY MANAGEMENT SYSTEMS AT RAM BAL PRIVATE LIMITED

Dr.Velumoni.D

Associate Professor,

Aswin.v

MBA final year Student,

School of Management Studies,

Sathyabama Institute of Science and Technology, Chennai – 600 119

Email: velumoni.soms@sathyabama.ac.in aswinvenkatesan43@gmail.com

ABSTRACT:

In the modern industrial environment, organizations are increasingly adopting Digital Quality Management Systems (DQMS) to improve product quality and overall efficiency. This study explores the effectiveness of DQMS implemented at Rambal Private Limited, with a focus on its role in enhancing quality practices and operational performance. The research examines how digital tools support better monitoring of processes, reduce manual errors, and enable quicker and more accurate decision-making. Primary data were collected using structured questionnaires and analyzed with appropriate statistical methods to understand the impact of the system. The results show that DQMS contributes to improved consistency in quality, increased productivity, and more efficient workflow management. At the same time, some challenges such as the need for employee training and system adaptability were observed. The study concludes that DQMS is a valuable tool for organizations aiming to strengthen their quality systems and achieve sustainable performance improvements.

Keywords

Digital Quality Management System, Quality Improvement, Operational Performance, Automation, Process Monitoring, Data-Based Decision Making.

INTRODUCTION:

In today's rapidly evolving industrial landscape, maintaining consistent product quality and improving operational efficiency have become critical for organizational success. With increasing competition and customer expectations, companies are moving beyond traditional quality management practices and adopting digital solutions to enhance their performance. One such advancement is the implementation of Digital Quality Management Systems (DQMS), which integrate modern technologies into quality control processes.

A Digital Quality Management System uses tools such as automation, real-time data tracking, and data analytics to monitor and control quality at every stage of production. Unlike conventional systems that rely heavily on manual documentation and delayed reporting, DQMS enables faster data collection, accurate analysis, and immediate corrective actions. This shift not only reduces the chances of human error but also improves transparency and accountability within the organization.

Rambal Private Limited, a company operating in a quality-sensitive manufacturing sector, requires strong quality management practices to meet industry standards and customer demands. The introduction of DQMS in such an environment helps streamline operations, improve consistency in product quality, and support better decision-making through reliable data insights. It also contributes to reducing defects, minimizing rework, and enhancing overall productivity.

This study aims to evaluate the effectiveness of Digital Quality Management Systems at Rambal Private Limited by examining their impact on quality performance, operational efficiency, and employee adaptability. The research also identifies the benefits and challenges associated with the system, providing insights into how digital transformation can improve quality management practices in manufacturing organizations.

REVIEW OF LITERATURE:

Kumar R. (2021) *Impact of Digital Quality Management Systems on Operational Performance*, International Journal of Quality Research, Vol. 14, pp. 45–53.

Kumar investigated how Digital Quality Management Systems influence operational performance in organizations. The study revealed that adopting digital tools enhances efficiency and minimizes errors in processes.

Sharma P and Verma S. (2020) *Role of Digital Technologies in Quality Improvement*, Journal of Industrial Engineering and Management, Vol. 13, pp. 120–130.

Sharma and Verma studied the contribution of digital technologies to quality improvement. Their findings showed that the use of automation and data analysis tools increases accuracy in quality-related activities.

Singh A. (2019) *Automation and Its Effect on Quality Management Systems*, Global Journal of Management Studies, Vol.9, pp.75–82. Singh explored the impact of automation on quality management systems. He found that automation decreases reliance on manual work and reduces the chances of human error. The research also indicated that automated processes allow quicker and more dependable quality inspections.

Patel M. (2022) *Real-Time Monitoring in Digital Quality Systems*, International Journal of Production Research, Vol.58, pp.210–218. Patel examined the role of real-time monitoring in digital quality systems. The study showed that continuous tracking of processes helps detect defects at an early stage.

Rao K. (2021) *Data-Driven Decision Making in Quality Management*, Journal of Operations Management, Vol.17, pp.60–68. Rao analysed the importance of using data for decision-making in quality management. He stated that reliable and timely data enables managers to make better decisions.

OBJECTIVES OF THE STUDY

Primary Objective

- To evaluate the effectiveness of Digital Quality Management Systems (DQMS) at Rambal Private Limited.

Secondary Objectives

- To examine the impact of DQMS on product quality and consistency.
- To study the role of automation in reducing errors in quality management processes.
- To assess the effectiveness of real-time monitoring in identifying and controlling defects.
- To understand how data-driven decision-making supports quality improvement.

RESEARCH METHODOLOGY

Research Design

This study employs a descriptive research design to systematically analyze current quality management practices and assess the effectiveness of digital systems within the organization.

Sampling Design

Convenience sampling was utilized to select participants from the production and quality departments.

Sampling Size

A total of 105 valid responses were obtained through structured questionnaires distributed via Google Forms between January and March 2026.

Data Collection

Primary Data: Employee responses related to experiences and perceptions of DQMS

Secondary Data: Academic literature and industry studies on digital quality systems

Tools:

In this study, it has various statistical tools like percentage analysis and statistical test like chi square for independence and Pearson correlation has been used.

DATA ANALYSIS AND INTERPRETATION

A. Percentage Analysis

Table I: Respondent Demographic Profile

Category	Group	Respondents (n)	Percentage
Age	20–25	32	30.5%
	26–30	39	37.1%
	31–35	25	23.8%
	Above 35	9	8.6%
Gender	Male	72	68.6%

	Female	33	31.4%
Experience	0–1 Year	14	13.3%
	1–3 Years	29	27.6%
	3–5 Years	44	41.9%
	Above 5 Years	18	17.1%

Table II: Summary of Survey Responses (Percentage Analysis)

Table II summarizes employee perceptions of the key operational impact dimensions of DQMS. The data show that employees have a consistently positive attitude toward digital quality tools, with the majority agreeing or strongly agreeing on all impact dimensions.

Survey Item	SA (%)	A (%)	N (%)	D (%)	SD (%)
DQMS improved understanding of real-time quality metrics	30.5	44.8	22.9	1.9	0.0
System provides clear visibility into production bottlenecks	16.2	48.6	32.4	2.9	0.0
Automated data collection increased accuracy of quality reports	35.2	39.0	20.0	4.8	1.0
Digitalization contributed to reduction in product rework	18.0	41.0	30.5	9.5	1.0
Real-time dashboards improved shop-floor decision-making speed	11.4	44.8	37.1	5.7	1.0
Integration of digital tools enhanced overall process transparency	14.3	52.4	21.9	10.5	1.0
DQMS has reduced material waste during production	19.0	39.0	29.5	10.5	2.0
Technical glitches disrupt quality monitoring	17.1	52.4	22.9	5.7	1.9
Initial workforce resistance to abandoning manual logs	12.4	52.4	29.5	4.8	1.0
Integrating new DQMS with legacy machinery was a major hurdle	17.1	46.7	25.7	9.5	1.0

High initial investment costs perceived as barrier to automation	14.3	45.7	25.7	13.3	1.0
Data security and privacy concerns in digital environment	18.1	38.1	32.4	10.5	1.0

B. one-way Anova:

Q3(work experience) vs Q8(Digitalization reduced product rework)

Hypothesis

H₀ (Null): There is no significant association between employee experience and their perception that digitalization reduced product rework.

H₁ (Alternate): There is a significant association between employee experience and perception of rework reduction.

Oneway

Descriptives

VAR00006

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
0 - 1 year	14	3.9286	1.20667	.32250	3.2319	4.6253	1.00	5.00
1 - 3 year	29	3.6552	.72091	.13387	3.3810	3.9294	2.00	5.00
3 - 5 year	44	3.5909	.89749	.13530	3.3180	3.8638	2.00	5.00
Above 5 years	18	3.6667	1.02899	.24254	3.1550	4.1784	2.00	5.00
Total	105	3.6667	.91638	.08943	3.4893	3.8440	1.00	5.00

Tests of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
VAR00006	Based on Mean	1.265	3	101	.291
	Based on Median	1.035	3	101	.380
	Based on Median and with adjusted df	1.035	3	88.933	.381
	Based on trimmed mean	1.146	3	101	.334

ANOVA

VAR00006

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.217	3	.406	.476	.700
Within Groups	86.117	101	.853		
Total	87.333	104			

Inference:

The p-value (0.700) is greater than 0.05, indicating no significant difference among the groups; hence, the null hypothesis is accepted.

C. Spearman’s correlation:

Q5 (Understanding of Real-Time Quality Metrics) ↔ Q9 (Speed of Shop-Floor Decision-Making)

Hypothesis

H₀: There is no significant correlation between understanding of quality metrics and decision-making speed.

H₁: There is a significant positive correlation between the two variables.

Scale Encoding (Likert 1–5)

Strongly Agree=5, Agree=4, Neutral=3, Disagree=2, Strongly Disagree=1

Correlations

			Digital QMS has improved my understanding of real-time quality metrics.	Real-time dashboards have improved the speed of shop-floor decision-making.
Spearman's rho	Digital QMS has improved my understanding of real-time quality metrics.	Correlation Coefficient	1.000	.203*
		Sig. (2-tailed)	.	.037
		N	105	105
	Real-time dashboards have improved the speed of shop-floor decision-making.	Correlation Coefficient	.203*	1.000
		Sig. (2-tailed)	.037	.
		N	105	105

*. Correlation is significant at the 0.05 level (2-tailed).

Inference:

The p value (0.203) is lesser than 0.05, indicating there is a positive and statistically significant relationship between digital QMS, Realtime dashboards, and improved decision-making efficiency.

FINDINGS:

The majority of respondents were aged 26–30 years (37.1%), male (68.6%), and had 3–5 years of work experience (41.9%).

A total of 75.3% of respondents agreed that the DQMS improved their understanding of real-time quality metrics.

About 74.2% believed that automated data collection enhanced the accuracy of quality reports.

Approximately 66.7% agreed that digital tools increased overall process transparency.

The implementation of DQMS was reported to have reduced material waste by 59%.

Around 69.5% of respondents reported that technical issues interfered with quality monitoring.

A total of 64.8% agreed that integrating DQMS with legacy machinery was a major challenge.

Similarly, 64.8% identified high initial investment as a barrier to automation.

About 56.2% of employees expressed initial resistance to replacing manual logs.

Additionally, 56.2% raised concerns regarding data security and privacy.

The p-value (0.700) is greater than 0.05, indicating no significant difference among the groups; hence, the null hypothesis is accepted.

The p value (0.203) is lesser than 0.05, indicating there is a positive and statistically significant relationship between digital QMS, Realtime dashboards, and improved decision-making efficiency.

SUGGESTIONS:

1. Provide proper training to employees to ensure they can effectively understand and use the system.
2. Establish a dedicated support team to resolve technical issues quickly and prevent work delays.
3. Design dashboards that are simple, user-friendly, and easy to understand.
4. Ensure that digital tools are fully compatible with the company's existing systems.
5. Regularly update the system to keep pace with new technological advancements.
6. Collect employee feedback regularly to identify issues and support continuous system improvement.

CONCLUSION:

The results of this study indicate that Digital Quality Management Systems (DQMS) significantly enhance the operational performance of Rambal Private Limited. The adoption of digital tools has improved work monitoring, reduced errors, and enabled faster, data-driven decision-making. However, certain challenges were identified, including technical issues, the time required for employees to adapt, and the costs associated with implementation. These challenges can be addressed through effective training programs, system enhancements, and better integration across all functional areas. Overall, the implementation of DQMS represents a crucial step toward improving organizational efficiency and achieving long-term growth.

REFERENCES:

- Kumar, R. (2021). Impact of digital quality management systems on operational performance. *International Journal of Quality Research*, 14, 45–53.
- Sharma, P., & Verma, S. (2020). Role of digital technologies in quality improvement. *Journal of Industrial Engineering and Management*, 13, 120–130.
- Singh, A. (2019). Automation in quality management systems. *Global Journal of Management Studies*, 9, 75–82.
- Patel, M. (2022). Real-time monitoring in digital quality systems. *International Journal of Production Research*, 58, 210–218.
- Rao, K. (2021). Data-driven decision making in quality management. *Journal of Operations Management*, 17, 60–68.
- International Organization for Standardization (ISO). (2015). *ISO 9001:2015 quality management systems—Requirements*.