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EFFECTS OF TOTAL QUALITY MANAGEMENT AND ROBOTIC PROCESS AUTOMATION INTEGRATION ON B2B SERVICES BUSINESS PERFORMANCE: THE MEDIATING ROLES OF BUSINESS PROCESS MANAGEMENT AND CUSTOMER SATISFACTION AT OOREDOO QATAR

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ABSTRACT

This study investigates the effects of Total Quality Management (TQM) practices and the integration of Robotic Process Automation (RPA) on business performance in the B2B service sector, with Business Process Management (BPM) and Customer Satisfaction examined as mediating variables. A quantitative approach was employed, utilizing a structured questionnaire distributed to 368 B2B service users at Ooredoo Qatar. The research model was tested using Structural Equation Modeling (SEM) with AMOS software to analyze the direct and indirect effects among the study variables. The findings demonstrate that both TQM practices and RPA integration significantly enhance BPM, which in turn positively influences customer satisfaction and business performance. TQM also directly improves business performance, while RPA exerts a significant impact on customer satisfaction but not directly on business performance. Mediation analysis confirms that BPM plays a pivotal role in transmitting the effects of TQM and RPA on business performance, whereas customer satisfaction acts as a partial mediator. The SEM model exhibited excellent fit indices (CFI = 0.997, TLI = 0.996, RMSEA = 0.018, GFI = 0.948). This research contributes to the literature by integrating quality management and automation perspectives in a single empirical model, highlighting the strategic role of BPM in digital transformation within B2B services. The findings provide actionable implications for managers seeking to enhance business performance through the alignment of quality practices and automation technologies.

KEYWORDS: Total Quality Management, Robotic Process Automation, Business Process Management, Customer Satisfaction, Business Performance, B2B Services.

1. INTRODUCTION

The telecommunications industry has become a prime example of rapid digital transformation, especially in the B2B sector where organizational complexity demands robust management practices. Total Quality Management (TQM) is increasingly recognized as a critical enabler of operational excellence, customer orientation, and sustainable competitive advantage (Raeesi Vanani & Yalpanian, 2025). By embedding a culture of continuous improvement, TQM supports organizations in adapting to dynamic markets and technological disruptions. Empirical studies show that TQM positively influences business process efficiency and service delivery effectiveness (Sakyi *et al.*, 2024). Such quality management initiatives are now integral to the strategic direction of leading telecommunications firms.

Robotic Process Automation (RPA) represents another transformative force, driving efficiency by automating rule-based, repetitive tasks across various business processes. The adoption of RPA in B2B telecommunications has been shown to reduce errors, minimize operational costs, and improve process consistency (Jude *et al.*, 2024). This technology is not only about replacing human labor but also about enhancing the accuracy and speed of information flows within organizations. Researchers emphasize that RPA, when integrated with other digital tools, amplifies the value of existing quality management systems (Gomaa, 2025). As a result, RPA is increasingly viewed as a key pillar in digital transformation roadmaps.

Business Process Management (BPM) serves as the organizational backbone for harmonizing quality management and automation technologies. Through systematic process analysis and redesign, BPM enables telecommunications companies to align their workflows with strategic business objectives (Ugwu & Njoku, 2025). Studies have found that BPM mediates the relationship between management practices and improved performance outcomes. The integration of BPM with RPA and TQM can generate greater agility and innovation in service delivery (Oliveira *et al.*, 2025). Consequently, BPM is central to realizing the full benefits of digital transformation.

Customer satisfaction is a vital metric for evaluating business performance in B2B telecommunications, reflecting both operational and relational success. As organizations pursue digital transformation, improving customer experiences has become a primary objective (Ristevska-Jovanovska, 2024). TQM and RPA are both recognized for their roles in enhancing customer satisfaction by delivering more reliable and responsive services.

Evidence suggests that customer-centric digital initiatives lead to higher retention rates and increased client loyalty (Goswami & Rainy, 2025). Therefore, integrating quality and automation strategies is essential for sustaining long-term customer value.

Despite these advancements, research on the combined effects of TQM and RPA, mediated by BPM and customer satisfaction, remains limited, especially in emerging markets and within the B2B context. Most existing studies have examined these constructs in isolation or lacked comprehensive analytical models (Shashi *et al.*, 2025). There is a need for more empirical research to clarify how these factors interact to influence business performance. Scholars advocate for integrated models that address both management and technological drivers of value (Zaman *et al.*, 2025). Addressing this gap is crucial for both academic advancement and practical management.

This study responds to these research gaps by investigating the interplay among TQM, RPA, BPM, and customer satisfaction in shaping business performance at Ooredoo Qatar. Employing structural equation modeling, the research analyzes direct and indirect effects of these variables in a real-world B2B telecommunications context. By integrating contemporary management and automation theories, the study offers new insights for both scholars and practitioners (Sarcea *et al.*, 2024). The findings contribute to the body of knowledge on digital transformation and organizational performance. Ultimately, this research highlights the importance of holistic strategies for driving excellence in the telecommunications industry.

2. LITERATURE REVIEW

2.1. Total Quality Management

Total Quality Management (TQM) is widely regarded as a comprehensive and strategic approach to organizational management, emphasizing continuous improvement, customer focus, and the involvement of all employees in quality initiatives. In B2B service industries such as telecommunications, TQM has been linked to enhanced service reliability, operational flexibility, and long-term business sustainability (Raeesi Vanani & Yalpanian, 2025; Sakyi *et al.*, 2024). Empirical research indicates that the implementation of TQM practices leads to greater organizational responsiveness and improved value delivery to business clients (Shashi *et al.*, 2025). Furthermore, TQM fosters a culture of accountability and learning, enabling companies to better adapt to technological disruptions and evolving market

demands. The role of TQM in driving business performance remains a central theme in both theoretical and applied management literature.

2.2. Robotic Process Automation

Robotic Process Automation (RPA) is transforming how organizations manage routine and repetitive tasks by leveraging software robots to automate rule-based processes. In the telecommunications sector, RPA adoption has been shown to reduce operational costs, minimize human errors, and increase process speed and consistency (Jude et al., 2024; Das, 2025). RPA's synergy with digital transformation initiatives accelerates the shift towards data-driven decision-making and enhances the efficiency of service delivery (Mateus & Rincón, 2025). Researchers have argued that integrating RPA with other management tools, including TQM and Business Process Management, maximizes the return on investment from automation projects. The evolving literature highlights RPA as a crucial driver for achieving operational excellence and sustaining competitive advantage in highly dynamic markets.

2.3. Business Process Management

Business Process Management (BPM) has emerged as an essential discipline for optimizing organizational workflows, aligning business operations with strategic goals, and supporting digital transformation. In recent studies, BPM has been identified as a key mediator between quality management initiatives and organizational outcomes (Rüeck et al., 2025; Ptashchenko et al., 2025). Effective BPM enables companies to streamline processes, improve interdepartmental collaboration, and facilitate continuous innovation in service delivery. The integration of BPM with automation technologies such as RPA amplifies the benefits of both approaches, resulting in more agile and resilient organizations (Sarcea et al., 2024). The literature emphasizes that BPM is foundational to realizing the performance gains promised by quality management and digitalization.

2.4. Customer Satisfaction

Customer satisfaction remains a cornerstone of business success in B2B telecommunications, reflecting both service quality and relationship management. Studies have shown that organizations that prioritize customer needs and incorporate feedback mechanisms tend to achieve higher levels of client retention and loyalty (Ristevska-Jovanovska, 2024; Mirzaye & Mohiuddin, 2025). TQM and RPA are both positively associated with improvements in customer satisfaction,

primarily by increasing reliability, responsiveness, and customization of services. BPM further enhances satisfaction by enabling more efficient handling of customer requests and reducing service delivery times (Gajdzik, 2025). Thus, the interplay between management practices, automation, and process optimization is central to delivering superior customer experiences.

2.5. Business Performance Outcomes and Integrated Models

The relationship between management practices, digital technologies, and business performance is a focus of ongoing research. Integrated models that combine TQM, RPA, BPM, and customer satisfaction offer a holistic perspective for understanding performance drivers in B2B service organizations (Petrukha et al., 2025; Shashi et al., 2025). Evidence from recent empirical studies supports the notion that these factors, individually and collectively, contribute to financial performance, process efficiency, and market competitiveness. However, the precise mechanisms and mediating pathways through which these variables interact require further investigation, particularly in emerging markets and rapidly digitizing industries. The current study aims to address this gap by empirically testing an integrated structural model within the context of a leading telecommunications company in Qatar.

3. METHODOLOGY

This research adopted a quantitative, cross-sectional survey design to examine the relationships among Total Quality Management (TQM) practices, Robotic Process Automation (RPA) integration, Business Process Management (BPM), customer satisfaction, and business performance in the B2B telecommunications context. The empirical setting for this study was in Ooredoo Qatar, a leading telecommunications service provider in the Middle East. The proposed conceptual framework was tested to analyze both the direct and indirect effects of the key variables using structural equation modeling (SEM).

The target population consisted of B2B service users at Ooredoo Qatar, including decision-makers such as managers, supervisors, and staff responsible for utilizing B2B services's telecommunication solutions. A purposive sampling technique was employed to select participants who were knowledgeable and actively engaged in B2B service usage. A total of 368 valid responses were collected, which satisfies the minimum sample size recommended for SEM analysis. The sample captured diverse demographics, including gender,

age, job position, length of customer relationship, as well as type and frequency of service usage.

Data collection was conducted using a structured questionnaire developed from validated scales in prior research. The instrument comprised sections measuring TQM, RPA, BPM, customer satisfaction, and business performance, utilizing a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). Both electronic and paper-based distribution methods were used to maximize response rates and ensure comprehensive representation. To enhance content validity, the survey instrument was reviewed by academic experts and practitioners, and a pilot test involving 30 participants was conducted to ensure clarity and reliability.

The validity and reliability of the measures were rigorously assessed. Cronbach's alpha, composite reliability, and average variance extracted (AVE) were calculated for each construct. All scales demonstrated high internal consistency (Cronbach's alpha > 0.86) and adequate convergent validity (AVE > 0.60). Confirmatory factor analysis (CFA) was employed to evaluate the measurement model, while the hypothesized relationships were tested using SEM with the AMOS 24.0 software package.

Model fit was assessed through several indices, including the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Goodness-of-Fit Index (GFI). Hypotheses regarding the direct and mediated relationships among TQM, RPA, BPM, customer satisfaction, and business performance were evaluated based on standardized path coefficients, t-values, and significance levels. Ethical considerations were strictly adhered to throughout the research process. Participation was voluntary and anonymous; all respondents were informed about the purpose of the study and provided their consent prior to data collection. Confidentiality of participant responses was ensured, and the data were used exclusively for academic purposes.

4. RESULTS AND DISCUSSION

This section reports the demographic profile of the survey respondents to contextualise the empirical results. Table 1 presents the characteristics of the 368 B2B customers, covering gender, age, job position, customer tenure, type of service used, and service usage frequency.

Table 1. Demographic Characteristics of Respondents

Variable	Category	Frequency (F)
Gender	Male	193
	Female	175
Age	< 25 years	58
	25–34 years	89
	35–44 years	100
	45–54 years	83
	> 55 years	38
Occupation/Position	Manager	31
	Supervisor	101
	Staff	188
	Others	48
Length of Being a Customer	< 1 year	25
	1–3 years	59
	4–6 years	121
	> 6 years	163
Type of Service Used	Internet/Data	211
	Voice/Telephone	97
	Cloud/Hosting	50
	IoT/Automation	10
Service Usage Frequency	Daily	203
	Several times a week	107
	Several times a month	44
	Rarely	14

Source: Primary data processed (2025)

Table 1 indicates a broadly balanced gender distribution (52.4% male; 47.6% female). Respondents are concentrated in the mid-career age groups, with 35–44 years representing the largest share (27.2%), followed by 25–34 years (24.2%) and 45–54 years (22.6%). Staff and supervisors comprise most of the sample (51.1% and 27.4%, respectively), while nearly half of respondents report customer tenure exceeding six years (44.3%). Internet/Data services are the most frequently used (57.3%), and usage intensity is high, with 55.2% reporting daily use. Overall, the sample reflects experienced and actively engaged B2B customers, providing a suitable basis for examining the relationships among TQM practices, RPA integration, BPM, customer satisfaction, and business performance.

Table 2 reports the mean values and reliability indicators for Total Quality Management (TQM), Integration of Robotic Process Automation (IRPA), Business Process Management (BPM), Customer Satisfaction, and Business Performance. This assessment is necessary to ensure that the constructs are measured reliably and exhibit adequate internal consistency and convergent validity prior to structural equation modelling.

Table 2. Descriptive Statistics and Construct Reliability

Construct	Mean	Cronbach's Alpha	CR	AVE
TQM Practices	3.560	0.945	0.947	0.749
RPA Integration	3.560	0.939	0.935	0.782
Business Process Management	3.720	0.950	0.932	0.774

Customer Satisfaction	3.780	0.962	0.946	0.815
Business Performance	3.770	0.958	0.933	0.735

Source: Primary data processed (2025)

As shown in Table 2, the mean scores of all constructs range from 3.56 to 3.78, indicating generally moderate to positive perceptions among respondents. Customer Satisfaction (mean = 3.78) and Business Performance (mean = 3.77) exhibit the highest average values, while TQM and IRPA record slightly lower but still acceptable mean levels (both 3.56). Reliability analysis demonstrates strong internal consistency, as all constructs exceed the recommended Cronbach's alpha threshold of 0.70, with values ranging from 0.939 to 0.962. Furthermore, composite reliability (CR) values are

above 0.90 and average variance extracted (AVE) values exceed the minimum criterion of 0.50, confirming satisfactory convergent validity. Overall, these results indicate that the measurement model is robust and suitable for subsequent analysis of the structural relationships.

Following the assessment of the measurement model, the overall adequacy of the proposed structural equation model was evaluated. Table 3 presents the goodness-of-fit indices used to determine whether the hypothesised model sufficiently represents the observed data.

Table 3. Model Fit Indices of Structural Equation Model

GOF Index	Model Value	Cut-off value	Model Fit Evaluation
Chi-square (χ^2)	240.837	≤ 249.128 (df = 214)	Good Fit
Probability	0.101	≥ 0.05	Good Fit
RMSEA	0.018	≤ 0.05	Good Fit
GFI	0.948	≥ 0.90	Good Fit
AGFI	0.933	≥ 0.90	Good Fit
CMIN/DF	1.125	≤ 2.00	Good Fit
TLI	0.996	≥ 0.95	Good Fit
CFI	0.997	≥ 0.95	Good Fit

Source: Primary data processed (2025)

As reported in Table 3, all goodness-of-fit indices indicate a well-fitting model. The chi-square probability value exceeds the recommended threshold ($p = 0.101$), while the normed chi-square (CMIN/DF = 1.125) remains well below the suggested upper limit. Incremental fit indices, including CFI (0.997) and TLI (0.996), exceed the commonly accepted cut-off values, and the RMSEA value (0.018) indicates a very low level of approximation error. Collectively, these results confirm that the structural model demonstrates an excellent fit, thereby providing a sound basis for interpreting the hypothesised relationships among the constructs.

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Table 4. Direct, Indirect, and Total Effects

Path	Direct Effect	Indirect Effect	Total Effect	p-value	Result
TQM Practices → Business Process Management	0.227	0	0.227	0	Significant
RPA Integration → Business Process Management	0.367	0	0.367	0	Significant
TQM Practices → Customer Satisfaction	0.109	0	0.109	0.035	Significant
RPA Integration → Customer Satisfaction	0.366	0	0.366	0	Significant
TQM Practices → Business Performance	0.116	0	0.116	0.015	Significant
RPA Integration → Business Performance	0.040	0	0.040	0.465	Not Significant
Business Process Management → Business Performance	0.342	0	0.342	0	Significant
Customer Satisfaction → Business Performance	0.341	0	0.341	0	Significant

Source: Primary data processed (2025)

The results in Table 4 reveal several important patterns. Both TQM practices and IRPA integration exert significant positive effects on business process management ($\beta = 0.227$ and $\beta = 0.367$, respectively), highlighting the combined importance of managerial quality initiatives and technological automation in strengthening process capabilities. While TQM Practices and IRPA shows a significant direct effect on customer satisfaction. With respect to business performance, TQM demonstrates a significant direct effect, whereas IRPA does not. However, BPM and customer satisfaction both show strong and significant effects on business performance, underscoring their critical role as performance-

enhancing mechanisms. Importantly, both TQM and IRPA exhibit substantial indirect effects on business performance through BPM and customer satisfaction, indicating that their contributions to performance are largely realised via process efficiency and relational outcomes rather than through direct pathways alone.

Given the prominence of indirect effects observed in the structural model, mediation analysis was conducted to further clarify the mechanisms through which TQM practices and IRPA integration influence business performance. Table 5 presents the results of the mediation analysis involving business process management and customer satisfaction.

Table 5. Mediation Analysis

Mediation Path	Direct Effect (β)	Direct p-value	Indirect Effect (β)	Indirect p-value	Total Effect (β)	Result
TQM Practices \rightarrow BPM \rightarrow Business Performance	0.116	0.017	0.078	0.000	0.194	Significant
RPA Integration \rightarrow BPM \rightarrow Business Performance	0.040	0.465	0.126	0.000	0.166	Significant
RPA Integration \rightarrow Customer Satisfaction \rightarrow Business Performance	0.116	0.017	0.037	0.042	0.153	Significant
RPA Integration \rightarrow Customer Satisfaction \rightarrow Business Performance	0.040	0.465	0.125	0.000	0.165	Significant

Source: Primary data processed (2025)

The mediation results demonstrate distinct mechanisms for TQM and IRPA. For TQM practices, both direct and indirect effects on business performance are significant, indicating partial mediation. This suggests that TQM contributes to performance not only through improvements in business process management and customer satisfaction but also through direct organisational benefits such as enhanced discipline, coordination, and quality orientation. In contrast, the effect of IRPA on business performance is fully mediated by BPM and customer satisfaction, as the direct effect is not significant while the indirect effect is substantial and significant. This finding implies that technological automation alone does not directly enhance performance; instead, its value is realised when automation is effectively embedded within business processes and translated into improved customer outcomes. Overall, the mediation analysis reinforces the central role of BPM and customer satisfaction as key conduits through which managerial and technological initiatives generate business performance gains.

The findings highlight the pivotal role of business process management (BPM) as the central mechanism linking managerial practices and digital automation to business outcomes. Both TQM practices and IRPA integration significantly enhance BPM, confirming that quality-oriented management

and process automation jointly strengthen organisational process capabilities. However, their downstream effects differ. TQM Practices and IRPA does exert a direct influence on customer satisfaction, suggesting that B2B customers respond more readily to tangible, process-enabled service improvements than to internally oriented quality initiatives. This distinction indicates that while TQM Practices builds a foundation for disciplined and standardised operations, its benefits for customers are largely indirect and contingent upon effective process execution. In contrast, IRPA delivers more immediate customer-facing benefits when it reduces delays, errors, and variability in service delivery.

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builds a foundation for disciplined and standardised operations, its benefits for customers are largely indirect and contingent upon effective process execution. In contrast, IRPA delivers more immediate customer-facing benefits when it reduces delays, errors, and variability in service delivery.

5. CONCLUSION

This study provides empirical evidence on how Total Quality Management practices and Robotic Process Automation integration jointly influence business performance through Business Process Management and customer satisfaction in a B2B service context. The findings demonstrate that BPM and customer satisfaction are not merely supporting variables but act as critical transmission mechanisms that convert managerial and technological initiatives into performance outcomes. While TQM contributes both directly and indirectly to business performance, the value of IRPA is realised almost entirely through its ability to strengthen process execution and enhance customer experiences. By distinguishing between

these mechanisms, the study advances the understanding of how quality management and digital automation operate differently yet complementarily within process-driven organisations.

From a practical perspective, the results suggest that organisations should prioritise BPM as the integrative platform through which quality initiatives and automation technologies are deployed. Investments in TQM and IRPA are unlikely to yield sustainable performance improvements unless they are aligned with end-to-end process design and explicitly oriented towards customer value creation. For managers, this implies shifting attention from isolated quality programmes or standalone automation projects towards coordinated process governance that links operational efficiency with relational outcomes. Overall, this study contributes to the quality management and digital transformation literature by demonstrating that sustainable business performance in B2B services emerges not from managerial practices or technology adoption alone, but from their effective orchestration through robust process management and customer-centric execution.

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