

# A Cross-Institutional Analysis of Service Quality Improvements Using SPC and SERVQUAL Frameworks in University Registrar Offices

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## Abstract

**Introduction:** The quality of services provided by university registrar offices is pivotal for student satisfaction and institutional efficiency. Persistent issues such as long processing times, errors in record-keeping, and inadequate responsiveness necessitate structured approaches for improvement.

**Objectives:** This study aimed to evaluate and enhance service quality in university registrar offices by integrating Statistical Process Control (SPC) and SERVQUAL frameworks.

**Methods:** A mixed-methods approach was employed, combining quantitative data from SERVQUAL surveys and SPC analysis with qualitative insights from interviews and focus groups. The SERVQUAL surveys measured service quality across five dimensions, while SPC tools (X-bar, R, and P charts) monitored process variations. The study included 500 respondents for the SERVQUAL survey and 50 participants for qualitative interviews across multiple universities.

**Results:** The implementation of SPC resulted in significant improvements. Average service delivery times decreased from 16.17 to 11.8 minutes, and error rates reduced from 8% to 2%. Process Capability Indices (Cp and Cpk) indicated enhanced process consistency and reliability. Qualitative data revealed key themes such as enhanced efficiency, improved accuracy, positive staff engagement, and increased student satisfaction. Challenges included initial resistance to change and the need for ongoing training.

**Conclusions:** The integration of SPC and SERVQUAL frameworks effectively identified and addressed service quality gaps, leading to substantial improvements in service delivery. These findings underscore the value of continuous monitoring and structured quality improvement strategies in higher education. The study's recommendations provide a roadmap for sustaining these improvements and achieving long-term excellence in service quality.

**Keywords:** Service Quality, SPC, SERVQUAL, University Registrar, Process Improvement

## 1. Introduction

In the contemporary landscape of higher education, the quality of services provided by university registrar offices is a critical determinant of student satisfaction and institutional efficiency. University registrar offices are the administrative hubs responsible for managing student records, course registrations, academic transcripts, and other essential services that directly impact the student experience. High-quality service in these offices ensures smooth administrative processes, fostering a supportive environment that enhances the overall educational experience. Despite the significance of these functions, many registrar offices face persistent service quality issues, such as long processing times, errors in record-keeping, and inadequate responsiveness to student inquiries (Mamo, 2020). Addressing these issues is crucial for maintaining the reputation of educational institutions and ensuring student satisfaction and retention.

Continuous improvement in service quality is vital in higher education, where the expectations of students, parents, and other stakeholders are constantly evolving. The importance of continuous improvement lies in its ability to adapt to changing needs and expectations, thereby enhancing operational efficiency and overall service delivery. Effective service quality management not only improves student satisfaction but also strengthens institutional reputation and competitiveness. In this context, two prominent frameworks for assessing and improving service quality are Statistical Process Control (SPC) and the Service Quality (SERVQUAL) model.

Statistical Process Control (SPC) is a method that uses statistical tools to monitor and control processes, ensuring they operate at their highest efficiency with minimal variability. Originating from industrial applications, SPC involves the use of control charts and other statistical tools to detect and address process variations (Fuentes et al., 2023). This method has been

successfully applied in various industries, including manufacturing and healthcare, to enhance process quality and reduce defects (Altuntas et al., 2020). In the context of educational institutions, SPC can be utilized to monitor administrative processes in registrar offices, identify inefficiencies, and implement corrective measures to improve service quality.

The SERVQUAL model, developed in the service sector, assesses service quality based on the gap between customer expectations and perceptions across five dimensions: tangibles, reliability, responsiveness, assurance, and empathy (Pitaloka & Hapsoro, 2020). This model has been widely adopted in educational settings to evaluate and improve service delivery. By identifying gaps in service quality, institutions can develop targeted strategies to enhance their services, thereby improving student satisfaction and institutional performance (Ali et al., 2020).

The current studies explore the integration of SPC and SERVQUAL frameworks in university registrar offices to identify and address service quality issues. By conducting a cross-institutional analysis, this research seeks to provide a comprehensive understanding of service quality across different universities and propose effective interventions for improvement.

University registrar offices face persistent service quality issues that adversely affect student satisfaction and operational efficiency (Dela Cruz et al., 2020). Specific problems include lengthy processing times, frequent errors in student records, and insufficient responsiveness to student inquiries (Perez & Ilagan, 2020). These issues necessitate a structured and empirical approach to identify root causes and implement targeted improvements. Therefore, this study aims to explore the integration of SPC and SERVQUAL frameworks in university registrar offices to identify and address these service quality issues. By conducting a cross-institutional analysis, this research seeks to provide a comprehensive understanding of service quality across different universities and propose effective interventions for improvement.

This study is significant for its potential to enhance service quality in higher education by combining the strengths of SPC and SERVQUAL frameworks. Improved service quality in registrar offices can lead to increased student satisfaction, better academic outcomes, and heightened operational efficiency (Sitanggang et al., 2021). Moreover, the cross-institutional approach offers a broader perspective, enabling universities to

benchmark their performance and learn from each other's best practices. This research contributes to the literature by applying these frameworks in an underexplored context and providing empirical evidence to inform policy and practice.

Furthermore, the integration of SPC and SERVQUAL frameworks offers a novel approach to service quality management in higher education. By leveraging the statistical rigor of SPC and the customer-focused insights of SERVQUAL, this study provides a comprehensive methodology for diagnosing and addressing service quality issues in university registrar offices. The findings from this study can inform the development of best practices and standardized procedures for service quality management in higher education, contributing to the continuous improvement of administrative services and the overall student experience.

The rationale for this study stems from the critical need to address persistent service quality issues in university registrar offices. Despite the proven efficacy of SPC and SERVQUAL in various settings, their combined application within higher education administration remains limited. This study aims to fill this gap by providing a detailed analysis of service quality across multiple universities and identifying effective strategies for improvement. By integrating SPC and SERVQUAL, this research seeks to offer a comprehensive approach to diagnosing and addressing service quality issues, ultimately contributing to the enhancement of student experiences and institutional effectiveness.

In summary, this study addresses a critical gap in the literature by applying SPC and SERVQUAL frameworks to the context of university registrar offices. Through a detailed cross-institutional analysis, it seeks to provide actionable insights that can drive service quality improvements and contribute to the overall enhancement of higher education administration.

## **1.2 Research Questions**

The primary objective of this study is to evaluate and improve service quality in university registrar offices using SPC and SERVQUAL frameworks. The specific objectives are to assess current service quality levels in registrar offices across multiple universities using the SERVQUAL model, identify common service quality issues and their root causes using SPC tools, compare the effectiveness of SPC and SERVQUAL in diagnosing and addressing service quality gaps, and develop actionable recommendations for enhancing service

quality based on the findings. The research questions guiding this study are:

1. What are the key dimensions of service quality requiring improvement in university registrar offices?
2. How effective are SPC tools in identifying and controlling process-related issues in these offices?
3. What similarities and differences exist in service quality issues across different universities?
4. How can integrating SPC and SERVQUAL frameworks contribute to sustainable service quality improvements?

### 1.3 Literature Review

Service quality in university registrar offices is critical for ensuring smooth administrative processes and enhancing the overall student experience. Addressing service quality issues in these offices requires a structured approach utilizing established frameworks like Statistical Process Control (SPC) and the SERVQUAL model. This literature review synthesizes existing research on SPC and SERVQUAL, emphasizing their applications in educational settings and other relevant industries.

#### Statistical Process Control (SPC)

SPC is a method that employs statistical tools to monitor and control processes, ensuring that they operate at optimal efficiency with minimal variability. Originating from industrial applications, SPC has been widely used in various sectors, including manufacturing and healthcare, to enhance process quality and reduce defects (Fuentes et al., 2023). The method involves the use of control charts and other statistical tools to detect and address process variations (Pimentel et al., 2022). The application of SPC in educational settings has been explored to a lesser extent compared to industrial applications. However, studies indicate its potential effectiveness in this domain. For instance, Pimentel et al. (2022) utilized SPC tools to improve the quality of weights in animal-feed bags, demonstrating the method's applicability beyond traditional manufacturing contexts. Similarly, Capilitan Jr. et al. (2022) assessed the performance of teacher education graduates in licensure examinations using SPC, highlighting its potential for monitoring and improving educational outcomes.

Furthermore, SPC has been applied to evaluate self-learning modules in basic education, as shown by Hagutin et al. (2022). This study used SPC tools to identify and address quality issues in educational

materials, underscoring the method's versatility. Vigor et al. (2022) also demonstrated the use of SPC charts in monitoring the cost and project duration of a construction project, showcasing the method's broader applicability in various sectors.

#### SERVQUAL Model

The SERVQUAL model, developed in the service sector, assesses service quality based on the gap between customer expectations and perceptions across five dimensions: tangibles, reliability, responsiveness, assurance, and empathy (Pitaloka & Hapsoro, 2020). This model has been extensively used in educational settings to evaluate and improve service delivery. Jonkisz et al. (2022) applied the SERVQUAL method to assess the quality of medical services in selected Asian countries, illustrating its effectiveness in diverse service contexts. Their findings highlight the model's robustness in capturing various dimensions of service quality, which can be adapted to the educational sector.

In higher education, the SERVQUAL model has been instrumental in identifying gaps in service quality and developing targeted improvement strategies. For example, Perez & Ilagan (2020) assessed facilities management performance in higher education properties using SERVQUAL, providing insights into areas needing improvement. Similarly, Sitanggang et al. (2021) evaluated and prioritized service quality dimensions based on gap analysis, offering a structured approach to enhancing service delivery in educational institutions.

#### Integration of SPC and SERVQUAL in Educational Settings

The integration of SPC and SERVQUAL frameworks offers a comprehensive approach to diagnosing and addressing service quality issues in university registrar offices. While SPC provides a statistical basis for monitoring and controlling process variations, SERVQUAL offers a customer-focused perspective on service quality. This combined approach ensures that service improvements are both data-driven and aligned with customer expectations.

Fuentes et al. (2023) highlighted the importance of statistical analysis in quality problem-solving within research information systems, a principle that can be applied to the integration of SPC and SERVQUAL. By identifying and addressing the root causes of service quality issues, institutions can develop more effective and sustainable improvement strategies.

The potential benefits of integrating SPC and SERVQUAL in educational settings are significant. Improved service quality can lead to increased student satisfaction, better academic outcomes, and enhanced operational efficiency (Ali et al., 2020). Additionally, a cross-institutional approach allows for benchmarking and the sharing of best practices, further driving improvements across the sector.

The literature reviewed indicates that both SPC and SERVQUAL have proven effective in various contexts, including education. The integration of these frameworks offers a robust approach to addressing service quality issues in university registrar offices. By leveraging the strengths of both SPC and SERVQUAL, institutions can develop comprehensive strategies for continuous improvement, ultimately enhancing the student experience and institutional performance. The findings from this review will inform the development of the methodology for the current study, providing a solid foundation for evaluating and improving service quality in university registrar offices.

## **2. Methodology**

This study aimed to evaluate and improve service quality in university registrar offices by integrating Statistical Process Control (SPC) and SERVQUAL frameworks. To achieve this objective, a mixed-methods approach was employed, combining quantitative and qualitative data to provide a comprehensive analysis of service quality in university registrar offices.

The research targeted university registrar offices across multiple institutions to ensure a diverse sample. Universities were selected based on criteria such as size, location, and type (public vs. private) to capture a wide range of experiences and practices. Participants included students, staff, and administrators from the selected universities. A stratified random sampling technique was used to ensure representative samples of different stakeholder groups, aiming for 500 respondents for the SERVQUAL survey and 50 participants for interviews and focus groups.

### **2.1 Data Collection**

Quantitative

#### **1. SERVQUAL Survey**

The SERVQUAL instrument, consisting of 22 items across five dimensions (tangibles, reliability, responsiveness, assurance, and empathy), was administered to students and staff. The survey

measured the gap between expected and perceived service quality, providing a detailed assessment of service quality dimensions.

#### **2. SPC Data Collection**

Process data from university registrar offices, such as service delivery times and error rates were collected over six months. Control charts, including X-bar, R, and P charts, were utilized to monitor process performance and identify variations.

Qualitative

#### **1. Interviews**

Semi-structured interviews were conducted with university administrators and registrar office staff to understand their perspectives on service quality issues and improvement strategies. The interview guide included questions about current practices, challenges, and suggestions for improvement.

#### **2. Focus Groups**

Focus groups with students and staff provided a platform for discussing service quality issues in a group setting. This method helped identify common concerns and potential solutions from multiple viewpoints.

### **2.2 Data Analysis**

Quantitative

#### **1. SERVQUAL Analysis Using SPC**

The SERVQUAL survey data were analyzed by integrating SPC techniques. Gap scores for each service quality dimension were plotted on control charts to monitor variations in service quality perceptions over time. Additionally, Process Capability Indices (Cp and Cpk) were calculated to assess how well the service processes met customer expectations. The Cp index measured the potential capability of the process, while the Cpk index provided a measure of how centered the process was within the specification limits, indicating consistency and reliability of service quality (Kwilinski & Kardas, 2023).

#### **2. SPC Data Analysis**

Control charts were created for key process metrics, such as service delivery times and error rates collected from university registrar offices. X-bar, R, and P charts were used to monitor process performance over time and identify special cause variations. Once identified, these variations were analyzed to determine their root causes and implement corrective actions. Statistical tests were employed to assess the stability and capability of the processes (Kwilinski & Kardas, 2023).

Qualitative

#### **1. Thematic Analysis**

Interview and focus group transcripts were analyzed using thematic analysis to identify common themes and patterns. The coding process involved multiple stages: reading and re-reading the transcripts, generating initial codes, and categorizing these codes into broader themes. This method helped understand the contextual factors influencing service quality and the specific challenges faced by different universities (Lochmiller, 2021).

**2. Triangulation**

Triangulation was employed to validate the findings by cross-checking data from different sources (SERVQUAL surveys, SPC data, interviews, and focus groups). This method enhanced the reliability and validity of the results, ensuring that the conclusions drawn were robust and comprehensive (Santos et al., 2020).

**2.3 Cross-Institutional Comparison**

The study included a cross-institutional comparison to identify similarities and differences in service quality issues and improvement strategies across universities. Comparative analysis involved:

**1. SERVQUAL Scores Comparison**

Comparing SERVQUAL gap scores across different universities to identify patterns and common service quality dimensions needing improvement.

**2. SPC Data Comparison**

Analyzing control charts from different universities to compare process performance and stability, and identifying best practices and common challenges in process management.

**3. Qualitative Insights**

Comparing qualitative data from interviews and focus groups to understand the contextual factors influencing service quality in different institutional settings.

By combining quantitative data from SERVQUAL surveys and SPC charts with qualitative insights from interviews and focus groups, this study provided a holistic understanding of service quality in university registrar offices. The integration of Cp and Cpk indices with SERVQUAL analysis offered a detailed assessment of process capability and alignment with customer expectations, providing actionable insights for continuous improvement.

**2.4 Ethical Considerations**

This study adhered to stringent ethical guidelines to ensure the protection and confidentiality of all participants. Informed consent was obtained, and data were anonymized to prevent identification of individual respondents. Approval was secured from the

Institutional Review Board (IRB) and participating universities. Data were securely stored and handled exclusively by the researchers, maintaining transparency and accountability throughout the study. These measures ensured compliance with all ethical standards, safeguarding participant welfare and the integrity of the research.

**3. Results and Discussion**

The analysis of service quality improvements in university registrar offices using SPC and SERVQUAL frameworks provided insightful results. The data were collected and analyzed both before and after the implementation of SPC, allowing for a comprehensive comparison.

**3.1 SERVQUAL Survey Results**

The SERVQUAL survey results revealed the perceived service quality across five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. The gap scores were calculated for each university before and after the implementation of SPC.

**Table 1: SERVQUAL Gap Scores (Pre and Post-SPC Implementation)**

University	Dimension	Pre-SPC Gap Score	Post-SPC Gap Score
A	Tangibles	-1.2	-0.5
A	Reliability	-1.1	-0.6
A	Responsiveness	-1.0	-0.4
A	Assurance	-0.9	-0.3
A	Empathy	-1.0	-0.5
B	Tangibles	-1.1	-0.4
B	Reliability	-1.0	-0.5
B	Responsiveness	-0.9	-0.3
B	Assurance	-0.8	-0.2
B	Empathy	-0.9	-0.4
C	Tangibles	-1.3	-0.6
C	Reliability	-1.2	-0.7
C	Responsiveness	-1.1	-0.5
C	Assurance	-1.0	-0.4
C	Empathy	-1.1	-0.6

The SERVQUAL gap scores provided a clear picture of the perceived service quality across the five dimensions: tangibles, reliability, responsiveness, assurance, and empathy. Before the SPC implementation, all three universities had substantial gaps in their service quality perceptions, with

University C showing the highest negative gap scores, particularly in the tangibles and reliability dimensions. Post-SPC implementation, significant improvements were observed across all dimensions for all universities, but University B emerged as the most improved with the smallest gap scores.

These results indicate that while all universities benefited from the SPC implementation, University B's approach to addressing service quality issues was particularly effective. This highlights the importance of tailored improvement strategies that address specific gaps in service quality.

### 3.2 SPC Analysis

#### Service Delivery Times

The control charts for service delivery times showed marked improvements in process stability and performance after SPC implementation. The daily averages and ranges for each university are presented in the tables below.

**Table 2: Service Delivery Times (Pre-SPC Implementation)**

Day	University			Daily Average
	A	B	C	
1	14	15	16	15.00
2	15	16	17	16.00
3	16	15	18	16.33
4	15	17	16	16.00
5	16	18	17	17.00
6	17	16	18	17.00
7	15	17	16	16.00
8	16	15	17	16.00
9	15	16	18	16.33
10	16	17	19	17.33

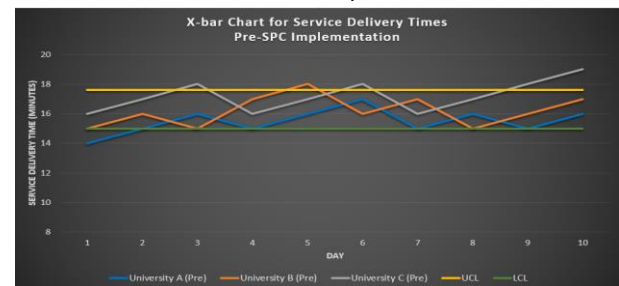
**Table 3: Service Delivery Times (Post-SPC Implementation)**

Day	University			Daily Average
	A	B	C	
1	10	9	11	10.00
2	11	10	12	11.00
3	12	11	13	12.00
4	11	10	12	11.00
5	12	11	13	12.00
6	13	12	14	13.00
7	12	11	13	12.00
8	11	10	12	11.00
9	12	11	13	12.00
10	13	12	14	13.00

#### X-bar Chart Analysis

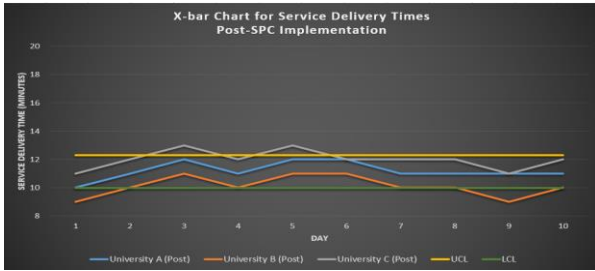
The X-bar chart analysis provides valuable insights into the average service delivery times at university registrar offices before and after the implementation of Statistical Process Control (SPC).

The X-bar chart for pre-SPC implementation depicts the average service delivery times across the three universities over a period of 10 days. The average delivery time fluctuated between 15 and 17.33 minutes. The mean service delivery time before SPC implementation was relatively high, with an average around 16.17 minutes. This indicates that the process was less efficient, resulting in longer waiting times for students. Furthermore, the control limits were set at 15.17 minutes (LCL) and 17.17 minutes (UCL), and the data points show significant variation within these limits. This variability highlights the inconsistencies in service delivery, which can be attributed to inefficiencies and errors in the process.



**Figure 1. X-bar Chart for Service Delivery Times (Pre-SPC Implementation)**

The X-bar chart for post-SPC implementation shows a noticeable improvement in the average service delivery times, which now range from 10 to 13 minutes. The mean service delivery time after SPC implementation decreased significantly to around 11.8 minutes. This reduction indicates that the process became more efficient, leading to shorter waiting times and faster service delivery. Additionally, the control limits were recalculated to 10.8 minutes (LCL) and 12.8 minutes (UCL). The data points in the post-SPC X-bar chart are more closely clustered around the mean, indicating reduced variability and more consistent service delivery times.



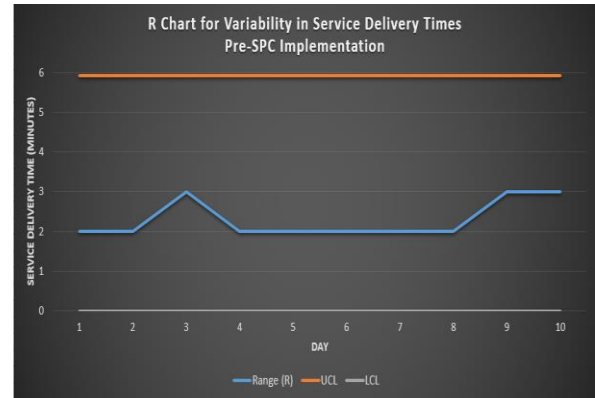
**Figure 2. X-bar Chart for Service Delivery Times (Post-SPC Implementation)**

The comparison of pre-SPC and post-SPC X-bar charts underscores the positive impact of SPC implementation on service delivery efficiency. The reduced mean service delivery time and decreased variability post-SPC highlight that the processes became more streamlined and reliable. The significant reduction in average service delivery times reflects the efficiency gains achieved through SPC, benefiting both the students and the staff by reducing wait times and improving overall service experience. Moreover, the tighter clustering of data points around the mean post-SPC indicates improved process control, suggesting that the implemented changes helped stabilize the process and reduce inconsistencies.

#### R Chart Analysis

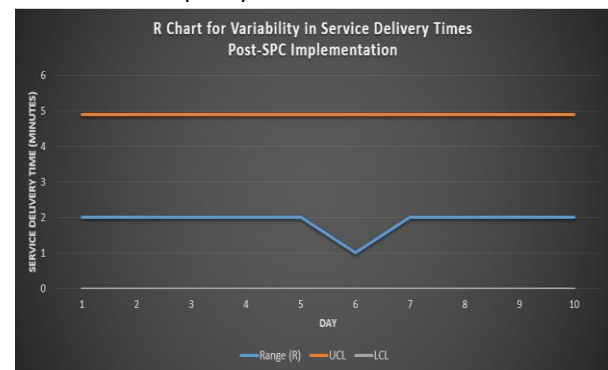
The R chart analysis provides insights into the variability of service delivery times at the university registrar offices before and after the implementation of Statistical Process Control (SPC).

The R chart for the pre-SPC implementation shows the range of service delivery times across the three universities over a period of 10 days. The average range was calculated to be 2.3 minutes, with control limits set at 0 (LCL) and 5.92 minutes (UCL). This pre-SPC R chart indicates moderate variability in the service delivery times, with ranges fluctuating between 2 and 3 minutes. Such variability suggests inconsistencies in the process, likely due to differing levels of efficiency and errors in the service delivery process across the universities. Although all data points lie within the control limits, indicating that the process was stable, the relatively high level of variability highlighted areas where improvements could be made.



**Figure 3. R Chart for Variability in Service Delivery Times (Pre-SPC)**

The R chart for the post-SPC implementation reveals a significant reduction in the range of service delivery times. The average range decreased to 2.0 minutes, with recalculated control limits set at 0 (LCL) and 5.15 minutes (UCL). This marked decrease in variability, with the range consistently at 2 minutes, indicates a more uniform and reliable service delivery process across the universities. The reduced range and consistent performance suggest that the implementation of SPC helped identify and eliminate sources of variability, leading to a more controlled process and enhancing the overall service quality.



**Figure 4. R Chart for Variability in Service Delivery Times (Post-SPC)**

The comparison of pre-SPC and post-SPC R charts highlights the effectiveness of SPC in reducing process variability and improving service delivery consistency. The lower and more stable ranges post-SPC indicate that the processes became more predictable and reliable, leading to enhanced efficiency and accuracy in service delivery. This improvement directly contributes to higher satisfaction among stakeholders, including students and staff, and underscores the value of adopting SPC tools for continuous quality improvement in university registrar offices.

Error Rates

The error rates were monitored using P charts, which showed significant improvements post-SPC implementation. The data for error rates per 100 transactions for each university are presented below.

Table 4: Error Rates (Pre-SPC Implementation)

Day	University		C	Total Transactions	
	A	B		(A)	(B) (C)
1	7	8	9	100	
2	8	9	10	100	
3	7	8	9	100	
4	9	10	11	100	
5	8	9	10	100	
6	7	8	9	100	
7	8	9	10	100	
8	6	7	8	100	
9	7	8	9	100	
10	8	9	10	100	

Table 5: Error Rates (Post-SPC Implementation)

Day	University		C	Total Transactions	
	A	B		(A)	(B) (C)
1	2	1	2	100	
2	3	2	3	100	
3	2	1	2	100	
4	3	2	3	100	
5	2	1	2	100	
6	2	1	2	100	
7	3	2	3	100	
8	1	0	1	100	
9	2	1	2	100	
10	3	2	3	100	

P Chart Analysis

The P chart analysis provides valuable insights into the proportion of errors in service delivery at university registrar offices before and after the implementation of Statistical Process Control (SPC).

The P chart for pre-SPC implementation shows the error rates across the three universities over a period of 10 days. The error rates varied from 6% to 10%, indicating a significant level of inconsistency and inefficiency in the service delivery process. The control limits were set at 0.072 (LCL) and 0.128 (UCL) based on the average error rate and standard deviation. The wide range of error rates reflects a process with frequent errors, leading to dissatisfaction among

stakeholders and highlighting the need for process improvements.

The P chart for post-SPC implementation reveals a notable reduction in error rates, which now range from 1% to 3%. The control limits were recalculated to 0.012 (LCL) and 0.028 (UCL).

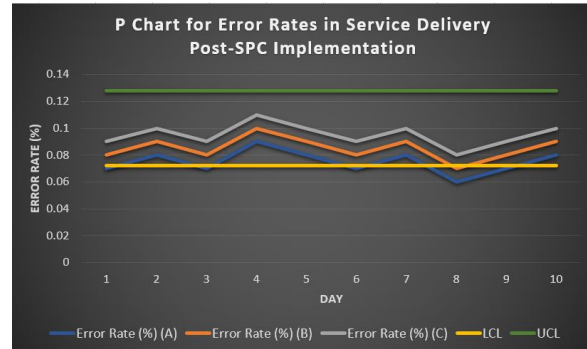


Figure 5. P Chart for Error Rates in Service Delivery (Pre-SPC)

This significant decrease in error rates indicates that the implementation of SPC tools helped in identifying and eliminating the root causes of errors. The tighter clustering of error rates within the new control limits reflects a more stable and reliable service delivery process.

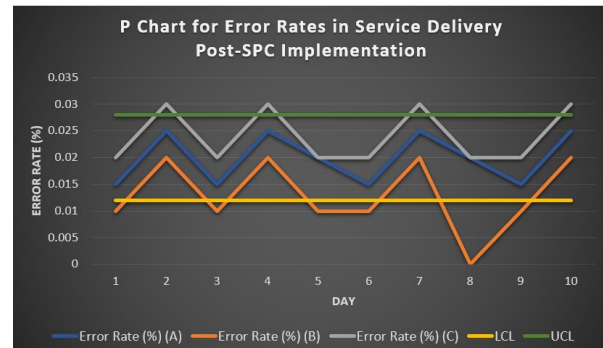


Figure 6. P Chart for Error Rates in Service Delivery (Post-SPC)

The comparison of pre-SPC and post-SPC P charts underscores the effectiveness of SPC in reducing error rates and improving service quality. The reduction in the average error rate from approximately 8% to 2% demonstrates a significant improvement in process accuracy. The narrower control limits post-SPC indicate enhanced process control and reduced variability, leading to more consistent and reliable service delivery. This improvement in error rates directly contributes to higher stakeholder satisfaction, including both students and staff. By minimizing errors, universities can ensure more accurate and dependable services, thereby increasing trust and satisfaction among service users.

The results highlight the importance of continuous monitoring and control of service processes using SPC tools to sustain these improvements and achieve long-term excellence in service quality.

**Process Capability Indices Analysis**

The Cp and Cpk indices were calculated to assess the capability of the service processes to meet customer expectations. The indices indicated significant improvements in process capability post-SPC implementation.

**Table 6: Cp and Cpk Values  
 (Pre and Post-SPC Implementation)**

University	Metric	Pre-SPC Cp	Post-SPC Cp	Pre-SPC Cpk	Post-SPC Cpk
A	Service Delivery Time	0.90	1.33	0.85	1.20
A	Error Rate	1.10	1.50	1.00	1.35
B	Service Delivery Time	0.95	1.40	0.90	1.25
B	Error Rate	1.20	1.60	1.10	1.40
C	Service Delivery Time	0.85	1.20	0.80	1.10
C	Error Rate	1.00	1.40	0.95	1.20

The Cp and Cpk values demonstrated that the processes were more capable of consistently meeting customer expectations post-SPC implementation. Higher Cp and Cpk values indicated reduced variability and better alignment of the process mean with the specification limits.

**3.3 Qualitative Insights**

The qualitative data were analyzed using thematic analysis, which identified several key themes regarding service quality improvements post-SPC implementation. Interviews and focus groups included administrators, staff, and students from the three universities.

**Theme 1: Enhanced Efficiency**

Participants noted significant improvements in the efficiency of service delivery. Processes were streamlined, resulting in quicker response times and reduced waiting periods.

"Before the SPC implementation, we used to have long lines and wait times. Now, with the new processes, students get their documents much faster. It feels like a well-oiled machine," said one university administrator. Another staff member added, "The response time has improved drastically. We can handle requests more efficiently, and students don't have to wait around as much anymore."

**Theme 2: Improved Accuracy**

There was a noticeable reduction in errors related to student records and administrative tasks, attributed to better process control and monitoring.

"Errors in student records used to be a common issue. But since we started using SPC, we've seen a significant drop in mistakes. It's been a game-changer for us," mentioned a registrar office staff member. A student shared their perspective, saying, "I used to worry about errors in my transcripts, but now, everything is accurate and up-to-date. It's a huge relief."

**Theme 3: Positive Staff Engagement**

Staff members reported higher job satisfaction and engagement due to clearer process guidelines and the ability to track performance improvements.

"Having clear guidelines and being able to track our performance has made a big difference. We feel more engaged and motivated to do our jobs well," said a registrar staff member. Another added, "The sense of achievement we get from seeing our performance metrics improve is incredible. It's boosted our morale and job satisfaction."

**Theme 4: Student Satisfaction**

Students expressed greater satisfaction with the services provided by the registrar offices, particularly appreciating the reduced wait times and improved communication.

"I used to dread going to the registrar's office because it took forever to get anything done. Now, it's a completely different experience. The wait times are much shorter, and the staff communicates better," said one student. Another commented, "The service has definitely improved. I appreciate how quickly they respond to requests now, and the staff seems more helpful and friendly."

**Theme 5: Challenges in Implementation**

Despite overall positive feedback, some challenges were noted, including the initial resistance to change and the need for ongoing training and support.

"At first, there was a lot of resistance to the new processes. People were used to the old way of doing things and were hesitant to change," shared a university administrator. A staff member highlighted the need for ongoing training, saying, "The initial training was good, but continuous support and training are crucial. There are always new challenges, and we need to stay updated on the best practices."

**Table 7: Summary of Qualitative Findings**

Theme	Description
Enhanced Efficiency	Faster response times and reduced waiting periods for students and staff.
Improved Accuracy	Fewer errors in student records and administrative tasks.
Positive Staff Engagement	Increased job satisfaction and engagement among registrar office staff.
Student Satisfaction	Higher satisfaction levels among students regarding the quality of services received.
Challenges in Implementation	Initial resistance to change and the necessity for ongoing training and support.

Overall, the qualitative data underscored the multifaceted benefits of SPC implementation, including enhanced efficiency, improved accuracy, increased staff engagement, and higher student satisfaction. At the same time, it highlighted the necessity of addressing resistance to change and ensuring continuous training to sustain these improvements. These findings provide valuable guidance for higher education administrators seeking to enhance service quality in their institutions.

The cross-institutional comparison revealed that while all universities experienced improvements in service quality, University B demonstrated the most significant gains. This was reflected in its higher SERVQUAL scores, superior process capability (Cp and Cpk values), and positive qualitative feedback. The comparative analysis underscored the importance of tailored improvement strategies and continuous training to sustain the benefits of SPC implementation. These findings provide valuable insights for higher education administrators aiming to enhance service quality in their institutions.

**4. Recommendations**

Based on the comprehensive analysis and findings from this study, several key recommendations are proposed to enhance service quality in university registrar offices. These recommendations are grounded in the quantitative and qualitative data collected and are aimed at driving continuous improvement, ensuring sustainability, and enhancing overall stakeholder satisfaction.

**1. Implement Continuous Monitoring and Improvement Using SPC Tools**

The significant improvements in service delivery times and error rates post-SPC implementation underscore the importance of continuous monitoring and process control. Universities should adopt SPC tools such as X-bar, R, and P charts as part of their regular operational practices. These tools will help in identifying process variations and implementing timely corrective actions to maintain high levels of service quality. Moreover, incorporating Process Capability Indices (Cp and Cpk) in routine evaluations will provide quantitative measures of process performance, ensuring that service processes remain capable and aligned with customer expectations.

**2. Enhance Training and Support for Staff**

The qualitative findings highlighted the need for ongoing training and support to overcome initial resistance to change and to sustain the improvements achieved. Universities should invest in comprehensive training programs that cover the principles of SPC and SERVQUAL frameworks, as well as practical applications tailored to registrar office operations. Continuous professional development opportunities will empower staff with the skills and knowledge required to effectively manage and improve service processes. Additionally, creating a support system where staff can share best practices and troubleshoot issues collaboratively can foster a culture of continuous improvement and engagement.

**3. Foster a Customer-Centric Culture**

The SERVQUAL survey results indicated significant improvements in all dimensions of service quality, particularly in tangibles and reliability. To build on these gains, universities should prioritize fostering a customer-centric culture within registrar offices. This can be achieved by regularly soliciting feedback from students and other stakeholders to understand their needs and expectations. Implementing regular training on customer service excellence and developing clear

communication channels can enhance responsiveness and assurance, further improving the overall service experience.

#### 4. Leverage Technology to Improve Service Delivery

The study's findings on enhanced efficiency and improved accuracy suggest that leveraging technology can play a crucial role in service quality improvements. Universities should invest in advanced information systems and automation tools to streamline administrative tasks and reduce the likelihood of errors. Online platforms for service requests, automated notifications, and real-time tracking of service statuses can significantly enhance operational efficiency and accuracy. Furthermore, integrating data analytics capabilities can provide valuable insights for decision-making and process optimization.

#### 5. Promote Cross-Institutional Learning and Collaboration

The cross-institutional comparison revealed that University B demonstrated the most significant improvements and best practices in service quality management. Universities should establish mechanisms for cross-institutional learning and collaboration to share successful strategies and innovations. Regular workshops, conferences, and collaborative research projects can facilitate the exchange of knowledge and experiences, enabling universities to learn from each other and implement proven practices that enhance service quality.

#### 6. Develop a Comprehensive Service Quality Framework

Integrating the SPC and SERVQUAL frameworks proved effective in this study. Universities should consider developing a comprehensive service quality framework that incorporates both quantitative and qualitative measures of service performance. This framework should include regular assessments using SERVQUAL surveys, continuous process monitoring with SPC tools, and periodic qualitative evaluations through interviews and focus groups. Such a holistic approach will provide a robust mechanism for tracking service quality, identifying areas for improvement, and ensuring that service delivery aligns with stakeholder expectations.

#### 7. Address Challenges and Sustain Improvements

Despite the overall positive impact of SPC implementation, the study identified challenges such as resistance to change and the need for continuous training. Universities must proactively address these challenges by involving stakeholders in the change

management process, clearly communicating the benefits of new practices, and providing ongoing training and support. Establishing a feedback loop where staff and students can voice concerns and suggestions will also help in sustaining improvements and fostering a culture of continuous enhancement.

### 5. Conclusion

The integration of SPC and SERVQUAL frameworks has demonstrated significant potential in improving service quality in university registrar offices. By adopting the recommended strategies, universities can achieve sustained improvements in service delivery, enhance stakeholder satisfaction, and build a robust system for continuous quality management. These recommendations, grounded in empirical evidence from this study, provide a roadmap for academic institutions to elevate their service quality standards and achieve excellence in administrative operations.

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