QUALITY CONTROL ANALYSIS OF BROCADE FABRIC PRODUCTS USING THE SIX SIGMA METHOD AT PT X IN CIMAHI CITY

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Abstract

In the manufacturing industry, product quality plays a crucial role in maintaining competitiveness and customer satisfaction amid increasingly intense domestic and global market competition. This condition has made quality control a critical aspect of the production process, particularly in the textile industry. PT X is a manufacturing company engaged in the textile sector, specializing in knitted fabrics and brocade fabrics, where various types of defects are still found in the brocade fabric production process and may reduce product quality. This study aims to evaluate the implementation and planning of quality control for brocade fabric products and to analyze quality improvement efforts using the Six Sigma method with the DMAIC (Define, Measure, Analyze, Improve, and Control) approach. A qualitative research method was employed, with data collected through interviews, observations, and documentation. Data validity was ensured using source, technique, and time triangulation. The results indicate that quality control implementation at PT X has generally been carried out in accordance with established plans; however, the application of Six Sigma has not been fully optimized, particularly at the improve and control stages. Therefore, continuous improvement efforts are required through the standardization of standard operating procedures (SOPs), operator training, machine maintenance, and regular quality monitoring to ensure consistent brocade fabric quality.

Keywords: Quality Control, Brocade Fabric, Six Sigma, DMAIC, Textile Industry

INTRODUCTION

Product quality is a fundamental factor in achieving competitiveness and enhancing customer satisfaction. The growing intensity of competition in both domestic and international markets obliges companies to consistently maintain high quality standards while ensuring cost efficiency in their operations (Zhang et al. 2022). Consequently, quality control has become one of the most critical and closely monitored aspects of the production process. Companies that successfully implement effective quality control systems are better positioned to sustain their competitiveness, even within highly competitive global markets (Kurnia et al. 2021).

The textile industry is one of the sectors that continues to grow and makes a significant contribution to the national economy. PT X is a company operating in the textile industry, particularly in the production of knitted fabrics and brocade fabrics. Located in Cimahi City, West Java, the company has been operating for more than 40 years and is recognized as one of the largest knitted fabric producers in Indonesia.

However, in its production process, various types of defects are still found, including pattern defects, untidy embroidery, weaving holes, yarn leakage, bowing, long embroidery stitches, needle drop defects, torn edges, spots, uneven colour (striping), staining, skewing, large holes, major tears, fuzziness, oil stains, fabric contamination, excessive length, and insufficient length.

The presence of these defects indicates that the implemented quality control system needs to be thoroughly evaluated. One method that can be applied to improve product quality and reduce defect rates is the Six Sigma method using the DMAIC approach. This method emphasizes systematic and continuous process improvement through the identification of defect causes and the implementation of corrective and preventive actions. Therefore, this study focuses on evaluating the quality control of brocade fabric products using the Six Sigma method at PT X.

Broca leakage and selected as the object of this study because it has a more complex production process, with defect types such as pattern defects, untidy embroidery, weaving holes, yarn leakage, and overlock-cut panels. Compared to other types of fabrics, brocade exhibits a higher defect rate, thus requiring stricter quality supervision. Previous studies applying the Six Sigma approach in the textile industry have demonstrated that the DMAIC method is effective in reducing defect levels and improving product quality (Lestari et al. 2019). The implementation of Six Sigma in the textile industry can reduce product defects, enhance customer satisfaction, and improve company competitiveness through tighter quality control (Raj et al. 2024).

In its production process, brocade fabric involves a combination of synthetic yarns, metallic yarns, and patterned knitting techniques, which require high precision during the knitting, dyeing, and finishing stages. One type of fabric with high added value in this industry is brocade fabric, which is known for its luxurious patterns and complex woven structures, as well as its extensive use in high-value fashion products such as kebaya, evening gowns, and modern traditional attire.

Therefore, the quality of brocade fabric is highly dependent on the accuracy of its production processes, making comprehensive quality control essential to maintain both the aesthetic and functional value of the fabric. The complexity of these processes makes brocade

fabric more susceptible to production defects, such as uneven weaving, uneven dyeing due to differences in yarn types such as metallic and polyester yarns and texture damage, which can reduce production efficiency and customer satisfaction. A study by Luo et al. (2024) indicates that machine-made brocade fabrics tend to have lower quality than handwoven brocade, particularly in terms of smoothness and elasticity, thereby requiring a more precise quality control system in mass production lines.

At PT X, the allowable defect tolerance is set at 3% for defects occurring during the production process and 5% for defects in the final products. These standards serve as guidelines for the quality control department in determining whether products are acceptable, require rework, or must be rejected. The following section presents data on defective brocade fabric products recorded from August 2024 to June 2025:

Table 1.
Production Data and Percentage of Defective Brocade Fabric Products at PT X (Period: August 2024 – June 2025)

Month	Total Producion (panels)	Defective Production (panels)	Percentage (%)
August 2024	10.424	497	4,8%
September 2024	35.759	1.452	4,1%
October 2024	44.653	1.826	4,1%
November 2024	49.569	2.076	4,2%
December 2024	39.795	2.609	6,6%
January 2025	39.590	2.034	5,1%
February 2025	40.942	2.632	6,4%
March 2025	21.147	1.617	7,6%
April 2025	28.716	1.507	5,2%
May 2025	40.492	2.539	6,3%
June 2025	44.183	2.714	6,1%
Average	**35.934**	**1.955**	**5,57%**

Source: PT X, processed data, 2025

Based on the data presented in Table 1.3, the defect rate of brocade fabric products during the period from August 2024 to June 2025 shows significant fluctuations. The highest defect rate occurred in March 2025, reaching 7.6%, while the lowest defect rates were recorded in September and October 2024, each at 4.1%. The average defect rate during this period was 5.57%, which slightly exceeded the company's established tolerance limit of 5% for defects in final products. These conditions indicate that the quality control of brocade fabric products needs to be further analyzed, as organizational capability in managing human resources, work processes, and internal coordination plays a key role in supporting organizational performance and product quality (Romi et al. 2020; Ludiya et al. 2024).

These findings indicate that the company needs to implement several improvement measures to reduce defect levels. First, the company should ensure regular machine maintenance to prevent defects caused by technical malfunctions. Second, stricter control of raw materials is necessary to maintain consistent quality throughout the year. In addition, the

company should conduct periodic operator training to minimize errors resulting from insufficient skills.

The implementation of the Six Sigma method using the DMAIC approach would greatly assist the company in identifying the root causes of defects and applying more focused and sustainable improvement solutions. The effectiveness of Six Sigma implementation in the textile industry has been demonstrated in previous studies, such as research conducted at PT Sukuntex, where the DMAIC approach successfully reduced the number of polyester fabric defects and significantly improved the process sigma level (Sokhibi et al. 2023). Therefore, it is expected that defect rates can be significantly reduced and that the final products will meet the company's established quality standards, thereby enhancing customer satisfaction.

PT X has implemented quality control measures in its production processes, which in practice have led to process improvement stages aligned with Six Sigma principles, particularly the DMAIC framework. However, this implementation has not yet been fully optimized, especially in the production of brocade fabrics, which exhibit relatively high defect rates and more complex process characteristics compared to other products.

Based on these conditions, this study aims to analyze brocade fabric quality control using the Six Sigma (DMAIC) approach to identify the root causes of defects and to formulate sustainable improvement recommendations. It is expected that the findings of this study will contribute to improving operational efficiency and achieving quality standards in accordance with customer requirements.

REVIEW OF LITERATURE

Quality Control in Manufacturing and Textile Industries

Quality control plays a crucial role in manufacturing industries, particularly in ensuring product consistency, reducing defects, and meeting customer expectations. According to Heizer and Render (2015), quality control is a systematic process aimed at monitoring, evaluating, and improving production processes to ensure that outputs conform to predetermined quality standards. Effective quality control not only minimizes defects but also enhances operational efficiency and organizational competitiveness.

In the textile industry, quality control is especially critical due to the complexity of production processes and the high sensitivity of textile products to variations in raw materials, machine conditions, and operator skills. Gaspersz (2012) emphasizes that textile manufacturing involves multiple interrelated processes such as knitting, dyeing, and finishing where small deviations can significantly affect final product quality. Therefore, comprehensive quality control is required at every stage of production to prevent defects and maintain consistent quality.

Several studies have shown that inadequate quality control in textile manufacturing often leads to high defect rates, increased rework costs, and reduced customer satisfaction. Hardani et al. (2020) highlight that effective quality control planning should focus on key factors such as raw material quality, machine maintenance, human resource competence, and process standardization to minimize production variability.

Six Sigma and the DMAIC Approach

Six Sigma is a quality management methodology that focuses on reducing process variation and defects through data-driven and systematic problem-solving approaches. According to Pande et al. (2014), Six Sigma aims to achieve near-zero defects by improving process capability and performance. The DMAIC framework Define, Measure, Analyze, Improve, and Control is the most used approach in Six Sigma implementation for process improvement.

The Define stage focuses on identifying critical quality issues and customer requirements. The Measure stage quantifies process performance using metrics such as Defects Per Million Opportunities (DPMO). The analyze stage identifies the root causes of defects using analytical tools such as Fishbone diagrams. The Improve stage develops and implements corrective actions, while the Control stage ensures that improvements are sustained over time (Gaspersz, 2012).

Six Sigma has been widely applied in manufacturing industries, including textiles, due to its effectiveness in reducing defects and improving product quality. Research by Lestari et al. (2019) demonstrates that the application of DMAIC in textile production successfully reduced defect rates and improved process stability. Similarly, Sokhibi et al. (2023) found that Six Sigma implementation in polyester fabric production significantly increased sigma levels and reduced product defects.

Six Sigma Implementation in the Textile Industry

Empirical studies indicate that Six Sigma is particularly suitable for the textile industry due to its ability to address complex production processes and multiple defect sources. Raj et al. (2024) state that Six Sigma implementation in textile manufacturing can improve quality consistency, enhance customer satisfaction, and strengthen competitive advantage by establishing tighter quality control mechanisms.

However, the successful application of Six Sigma in textiles depends on several factors, including management commitment, employee involvement, accurate data collection, and continuous monitoring. Luo et al. (2024) highlight that machine-made brocade fabrics tend to exhibit lower quality compared to handwoven products, particularly in terms of smoothness and elasticity, emphasizing the need for precise quality control systems in mass production environments.

Previous research also suggests that defect rates in textile products are influenced not only by production volume but also by process stability, raw material consistency, machine performance, and operator workload (Sari et al. 2022). Therefore, Six Sigma provides a comprehensive framework for identifying and controlling these factors through structured and continuous improvement efforts.

Research Gap

Although numerous studies have examined the application of Six Sigma in textile manufacturing, limited research has specifically focused on quality control of brocade fabric products, which involve more complex materials and production processes. Brocade fabric production combines synthetic and metallic yarns with intricate patterns, making it more susceptible to defects compared to other textile products. Moreover, existing studies often emphasize quantitative defect reduction without exploring in-depth process dynamics using a qualitative approach.

Therefore, this study fills the research gap by analyzing brocade fabric quality control at PT X using the Six Sigma DMAIC framework through a qualitative perspective. By identifying root causes of defects and formulating sustainable improvement recommendations, this research is expected to contribute both theoretically and practically to quality control implementation in the textile industry

RESEARCH METHOD

This study employs a qualitative approach using a descriptive method to gain an in-depth understanding of quality control in brocade fabric products at PT X. The qualitative approach was selected because the research focuses on understanding processes, behaviors, and dynamics of quality control that cannot be adequately explained through quantitative analysis (Moleong, 2015; Pahleviannur, 2020). The descriptive method is used to portray the actual conditions of quality control as they occur in the field without hypothesis testing (Narbuko et al. 2015).

The research was conducted at PT X, a textile manufacturing company producing brocade fabrics located in Cimahi City, West Java, during the period from May to December 2025. The focus of the study is on quality control of brocade fabric products using the Six Sigma DMAIC method. The main research variable is quality control, which is defined as a series of organizational activities aimed at controlling variation and product defects to meet quality standards and customer expectations (Collins et al. 2021).

The operationalization of the quality control variable includes four main dimensions: planning, implementation, evaluation, and improvement and development efforts in quality control. These dimensions are analyzed through indicators covering raw materials, machine condition and maintenance, operator competence, production processes, production environment, and coordination across production stages. All indicators are analyzed qualitatively to comprehensively describe the implementation of quality control at PT X.

In accordance with the characteristics of qualitative research, this study does not apply the concept of a population but rather focuses on a social situation consisting of place, actors, and activities (Sugiyono, 2022). Research informants include the Head of the Human Resources Department, the Head of Production, QC-Intermediate staff, and the QC-Brocade Coordinator, selected based on their direct involvement in the quality control system. The observed activities encompass planning, implementation, evaluation, and quality control improvement efforts for brocade fabric products.

The primary research instrument is the researcher, who collects data through interviews, observations, and documentation (Sugiyono, 2022; Creswell, 2023). The research data consist of primary data obtained from in-depth interviews and direct observations in the production area, as well as secondary data in the form of Quality Control SOPs, fabric inspection reports, raw material receiving reports, and recapitulated data on defective products for the period August 2024–June 2025.

Data analysis is conducted qualitatively through the stages of data reduction, data display, and conclusion drawing and verification (Hardani et al. 2020). Data validity is ensured through source, technique, and time triangulation to enhance the credibility and reliability of the research findings.

RESULTS AND DISCUSSION

Quality Control Planning

The planning of quality control for brocade fabric products at PT X is focused on ensuring that the production process operates in accordance with the quality standards established by the company. The planning emphasis is directed toward controlling raw materials, machine condition and maintenance, operator competence, and control of production process stages, particularly in the dyeing and finishing processes. This planning aims to minimize the potential occurrence of product defects and to improve the consistency of the quality of the brocade fabric produced.

This quality control planning aligns with the Six Sigma concept, which emphasizes the importance of the Define stage in identifying critical quality characteristics and potential sources of defects at the early stages of the production process. According to Gaspersz (2012), effective quality planning must be able to identify the main factors influencing product quality so that companies can control process variation effectively. This is further supported by previous studies stating that quality control planning focused on raw materials, machinery, and human resources plays a significant role in reducing defect rates in manufacturing products (Hardani et al., 2020).

Thus, quality control planning at PT X serves not only as an operational guideline but also as a strategic foundation for implementing the Six Sigma method to control and continuously improve the quality of brocade fabric products.

Quality Control Implementation

The implementation of quality control for brocade fabric products at PT X is carried out in an integrated manner with the production process, where the quality control (QC) function operates alongside each production stage to ensure that both processes and outputs comply with established quality standards. Quality control is implemented continuously, starting from raw material inspection, production process monitoring, to final product inspection before packaging.

At the initial stage, quality control implementation begins with raw material inspection to ensure compliance with material specifications and quality requirements. This inspection aims to prevent substandard raw materials from entering the production process. According to Heizer and Render (2015), effective quality control must start with controlling production inputs, as raw material quality strongly determines the quality of the resulting output.

Subsequently, QC implementation focuses on critical production processes, particularly the dyeing and finishing stages. Supervision is conducted to ensure process stability, compliance with production parameters, and the quality of intermediate outputs. Previous studies have shown that the finishing process is one of the stages with the highest risk of defects in the textile industry, thus requiring stricter quality supervision (Gaspersz, 2012). This finding is consistent with the conditions at PT X, where most product defects occur during these stages.

At the final stage, QC conducts a final inspection to ensure that brocade fabric products meet company quality standards before being approved for shipment. This quality control implementation is supported by coordination among the production department, QC, and Quality Assurance (QA). According to Pahleviannur (2020), cross-functional

coordination in quality control implementation plays a crucial role in improving quality control effectiveness and preventing recurring defects.

Therefore, quality control implementation at PT X is not only oriented toward defect detection but also toward comprehensive control of the production process in accordance with Six Sigma principles.

Quality Control Evaluation

The evaluation of quality control for brocade fabric products at PT X is conducted to assess the effectiveness of the implemented quality control system and to identify defect levels that still occur during the production process. This evaluation represents a critical stage in the Six Sigma method, particularly within the Measure and Analyze phases, as it serves as the basis for continuous quality improvement decision-making.

Quality control evaluation is carried out through the analysis of defective product data obtained from QC inspection results during the production period. One of the main indicators used in quality evaluation is the Defects Per Million Opportunities (DPMO) value, which quantitatively represents the level of product defects. Based on the calculation results, the DPMO value of PT X's brocade fabric products indicates that defect levels remain relatively high, meaning that the zero-defect condition has not yet been fully achieved. This finding suggests that although a quality control system has been implemented, there are still process variations that need to be more optimally controlled.

The evaluation results also reveal fluctuations in product defect levels during certain production periods. In some months with relatively lower production volumes, defect rates increased. This condition indicates that high defect levels are not solely influenced by production volume, but also by internal process factors such as changes in raw materials, operator workload, and machine condition and maintenance. This finding is consistent with the study by Sari et al. (2022), which states that variations in manufacturing product quality are more influenced by process stability and consistency of quality control than by production output levels.

In addition, quality evaluation is conducted through defect cause analysis using the Fishbone (Ishikawa) diagram with the 5M approach (Man, Machine, Material, Method, and Measurement). The analysis results indicate that defects in brocade fabric products at PT X are not caused by a single factor, but rather by the interaction of multiple interrelated factors. According to Prasetyo and Haryono (2020), the use of Fishbone diagrams in quality evaluation is effective in identifying the root causes of quality problems and serves as a foundation for formulating targeted corrective actions.

Thus, the evaluation of quality control at PT X demonstrates that although the quality control system has been implemented in a structured manner, further improvement efforts are still required, particularly focusing on the main factors causing product defects. The results of this evaluation serve as an important basis for the Improve stage in the DMAIC method to design sustainable quality improvement strategies for brocade fabric products.

Quality Control Improvement and Development

Based on the evaluation results and defect cause analysis, quality control improvement efforts for brocade fabric products at PT X are focused on controlling critical factors within the production process. Improvements are carried out through enhanced selection and quality supervision of raw materials from suppliers, strengthening machine maintenance and inspection schedules, and increasing supervision during the dyeing and

finishing processes as stages with the highest defect potential. In addition, operator workload management and improved coordination between production and quality control departments are integral components of quality control system development. These improvement and development efforts are expected to sustainably reduce defect levels and enhance the consistency of brocade fabric quality.

Quality control improvement and development efforts at PT X are implemented based on the Six Sigma approach through the DMAIC stages. The following describes each stage:

1. Define Stage: The main problem identified is the high level of product defects during certain periods, even when production volumes are relatively low.

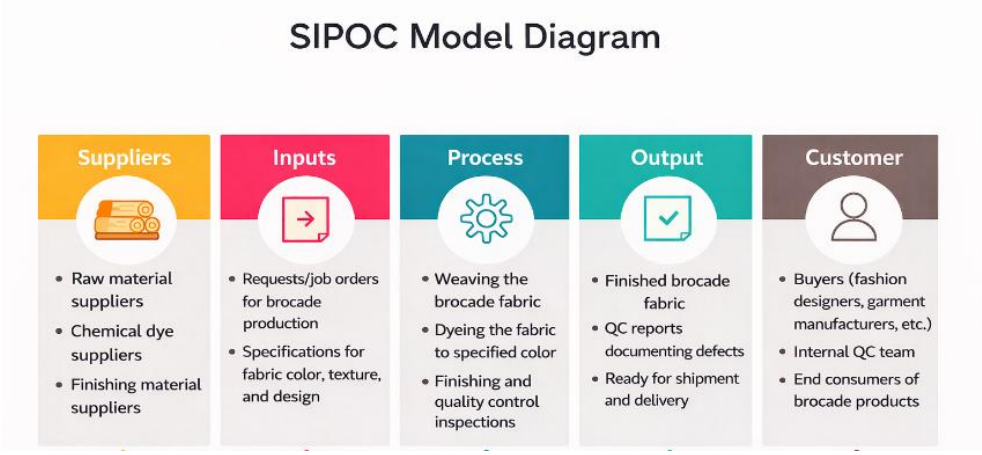

Figure 1.
SIPOC Model Diagram

The SIPOC diagram illustrates the brocade fabric production process at PT X, starting from suppliers, inputs, process stages, outputs, and customers. SIPOC mapping is used to provide a comprehensive overview of the relationships among process elements and to identify critical areas that have the potential to affect product quality. The results of this mapping serve as the foundation for the Define stage in the Six Sigma DMAIC method to determine the focus of quality issues to be analyzed further.

2. The Measure stage indicates significant variations in defect levels across production periods, with the highest defect rate occurring in March 2025.
   At this stage, PT X ensures that the final products are in good condition and free from defects, whether originating from the production process or from final product outcomes. The level of product defects is measured using the Defects Per Million Opportunities (DPMO) metric. The following is the calculation of the DPMO for brocade fabric products at PT X:

$$\text{DPMO} = \left(\frac{\text{Number of Defects}}{\text{Number of Units} \times \text{Opportunities per Unit}}\right) \times 1{,}000{,}000$$

Assumption: One defect opportunity per unit (to simplify the analysis)
Known data:
Total Production (panels) = 35,934 panels

Total Defective Products (panels) = 1,955 panels

$$\text{DPMO} = \left(\frac{1{,}955}{35{,}934 \times 1}\right) \times 1{,}000{,}000$$

$$\text{DPMO} = 54{,}400$$

The calculated DPMO value indicates that the brocade fabric production process at PT X still experiences a relatively high level of defects, suggesting that further quality improvement efforts are required in subsequent DMAIC stages. Based on the calculation results, a DPMO value of 54,400 was obtained, indicating that out of every one million production opportunities, approximately 54,400 brocade fabric panels have the potential to experience defects. This value indicates that the product defect level remains relatively high, thus requiring quality improvement efforts in subsequent production stages.

At the Measure stage, the evaluation of defect levels in brocade fabric products at PT X was conducted using the Six Sigma approach through the calculation of Defects Per Million Opportunities (DPMO). The measurement results show that the DPMO value for brocade fabric products is 54,400, indicating that approximately 54,400 product units per one million production opportunities are potentially defective. This high DPMO value suggests that the defect rate is still relatively high and that the implemented quality control system has not yet operated optimally. Therefore, the measurement results serve as the basis for further analysis to identify the root causes of defects and to formulate improvement efforts in subsequent production stages.

3. The Analyze stage reveals that the main causes of product defects originate from raw material nonconformities, suboptimal machine conditions and maintenance, and increased operator workload during periods of high demand. This finding is consistent with Ratnamurni et al. (2022), who emphasize that systematic quality risk management using analytical tools such as FMEA is effective in identifying potential failure sources and prioritizing corrective actions to reduce quality defects.

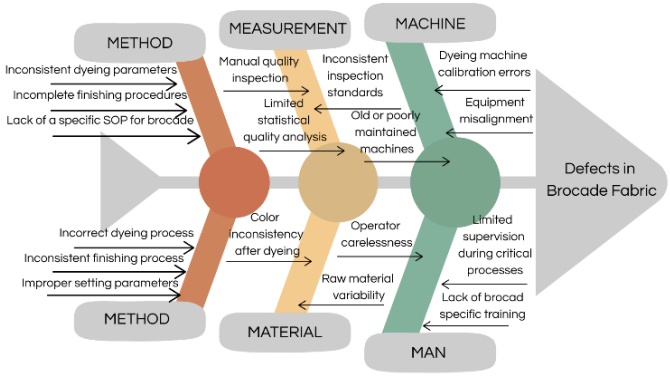

Figure 2.
Defects in Brocade Fabric

The analysis of the causes of defects in brocade fabric products at PT X was conducted using a Fishbone (Ishikawa) diagram with the 5M approach, namely Man, Machine, Material, Method, and Measurement. This analysis was developed based

on direct observations, interviews with relevant personnel, and an evaluation of the existing quality control process.

1) The man factor relates to the competence and consistency of human resources in the production and quality control processes. Differences in understanding quality standards among operators and inconsistent QC accuracy were identified, particularly in visual inspections such as patterns and fabric surface conditions. This condition may lead to inconsistent quality control outcomes. This condition has the potential to result in inconsistent quality control outcomes. These findings are consistent with previous studies indicating that leadership styles and organizational conditions are closely associated with employee behavior and loyalty, which in turn affect task execution consistency and overall work quality within organizations (Romi et al. 2022). In addition, Romi (2024) emphasizes that psychological aspects and organizational behavior significantly influence individual performance, including accuracy and responsibility in carrying out quality control functions.
2) The machine factor is related to the condition and stability of production machines, particularly in the finishing process. Suboptimal machine settings and insufficient maintenance can trigger defects such as uneven fabric texture and pattern damage, thereby affecting the consistency of final product quality. These findings are consistent with previous studies indicating that the condition and reliability of production machinery have a significant influence on process stability and product defect rates (Ludiya et al. 2024). Therefore, machine-related factors represent one of the primary causes that require particular attention in efforts to improve the quality of brocade fabric products.
3) The material factor indicates that variations in raw material quality and nonconformity of yarn specifications affect the dyeing and finishing processes. Non-uniform raw materials may cause colour inconsistencies and visual defects in brocade fabrics.
4) The method factor is associated with the implementation of work procedures and quality control SOPs. Inconsistencies in SOP implementation, the use of manual inspection checklists, and suboptimal coordination between departments can reduce the effectiveness of the planned quality control system.
5) The measurement factor reflects a quality measurement system that is still largely manual and not yet optimally integrated. This condition increases the likelihood that quality deviations are not detected at an early stage, thereby increasing the risk of defects in the final production stage.

Based on the Fishbone diagram analysis, it can be concluded that defects in brocade fabric products at PT X are influenced by the interaction of multiple factors related to human resources, machines, materials, methods, and measurement systems.

Therefore, integrated and continuous quality control improvement efforts are required by addressing all five factors comprehensively.

4. Based on the analysis results, the Improve stage is focused on strengthening raw material selection from suppliers, enhancing maintenance of production machines, and reinforcing quality supervision during the dyeing and finishing processes as critical production points.

   The Improve stage is carried out after identifying the main factors causing defects in brocade fabric products through Fishbone analysis. At this stage, PT X formulates and implements various improvement initiatives aimed at reducing defect rates and improving quality consistency in accordance with the established quality control plans.

   Improvement efforts focus on the human resource factor by enhancing operator and quality control personnel understanding and consistency regarding product quality standards. Re-briefing on brocade fabric quality criteria is conducted, particularly for critical processes such as dyeing and finishing. In addition, the use of quality inspection checklists is reinforced to minimize differences in quality interpretation among QC personnel.

   From the machine and equipment perspective, improvements are implemented through more controlled machine setting adjustments and enhanced coordination between the production and maintenance departments. Routine machine condition checks before production begins are conducted to ensure machine stability and to prevent defects caused by machine performance issues.

   Improvement efforts related to the material factor are carried out by tightening raw material inspections prior to use in the production process. Raw materials are ensured to meet company quality specifications, and materials are grouped based on quality grades to reduce variation in brocade fabric production results. This is consistent with Nugraha et al. (2022), who state that employee competence and commitment have a significant effect on performance quality and the achievement of quality standards.

   From the method and measurement perspective, the company strengthens consistency in implementing quality control SOPs and improves cross-departmental coordination in responding to defect findings. QC inspection data are utilized as periodic evaluation materials to identify recurring defect patterns. The use of these data supports the continuous application of the DMAIC method, ensuring that improvements are systematic rather than temporary.

5. The Control stage is implemented through more consistent quality supervision and periodic evaluations to ensure that improvement efforts can be sustained over time. The DMAIC approach is expected to enhance the effectiveness of quality control and continuously reduce defect levels in brocade fabric products at PT X.

The Control stage represents the final phase in the application of the DMAIC approach for quality control of brocade fabric products at PT X. This stage aims to ensure that all improvement initiatives implemented during the Improve stage are maintained consistently and sustainably, thereby preserving product quality in accordance with company standards.

At this stage, implemented improvements are reintegrated into the existing quality control system, particularly through strengthening inspection procedures, periodic monitoring of production processes, and documentation of quality control results. With continuous supervision, the company can ensure that potential defects are detected early and do not recur repeatedly.

The implementation of the Control stage demonstrates that quality control at PT X is not limited to short-term improvements but is directed toward establishing a sustainable monitoring system. As a result, the quality of brocade fabric products can be maintained consistently, supporting the achievement of previously planned quality control objectives.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that PT X has implemented a structured quality control system for brocade fabric products that is well integrated with the production process. Quality control is carried out through raw material inspection, monitoring of production processes particularly during the dyeing and finishing stages and final product inspection prior to the packaging process.

The application of the Six Sigma method using the DMAIC stages (define, measure, analyze, improve, and control) serves as a framework for identifying quality problems, measuring defect levels, analyzing the causes of defects, and formulating as well as controlling quality improvement efforts. The results of quality measurement using the DPMO value indicate that product defects are still present; therefore, the zero-defect condition has not yet been fully achieved.

The analysis results show that the quality of brocade fabric products is influenced by various factors, including raw material quality, machine condition and maintenance, operator competence, work methods, and the quality measurement system. The company has undertaken improvement efforts through enhanced process supervision, rework of defective products, and periodic quality evaluations conducted by the Quality Assurance (QA) department. Thus, it can be concluded that the quality control system at PT X has been implemented effectively and systematically; however, continuous improvement is still required to further enhance and consistently maintain the quality of brocade fabric products.

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