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Optimization of the inspection process using business process improvement methods

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Abstract

Companies must ensure that the products and services produced are in accordance with established standards. To ensure that products are in accordance with customer desires, companies can implement quality control in the form of inspection activities. Inspection is essential to control quality, as well as detect products that do not meet standards. This is done to comply with the requirements in ISO 9001:2015 clause 8.1 concerning operational planning and control. In this research case study, it is known that Kaffa Indonesia received customer complaints about clothing products received. Complaints include wrong sizes, untidy stitching, incorrect types of goods, holes, and oil stains on clothing. Defective clothing products received by customers can occur due to an unstructured inspection process so there are defective goods that get through. The solution to this problem is to improve the inspection process using the Business Process Improvement (BPI) method and design a Standard Operating Procedure (SOP) along with supporting documents. In this study, improvements were made to the inspection process by implementing streamlining tools. The business proposal process can reduce errors in the form of defects that get through to customers so that it can reduce customer complaints. In the proposed SOP there are supporting documents in the form of checksheet forms for documentation purposes. This proposed SOP is intended to optimize the inspection process to minimize customer complaints regarding clothing products produced by Kaffa Indonesia. The results of this study were a reduction of 2 non-value added activity in business process and standardization in the inspection process.

Keywords: business process improvement, customer complaints, inspection, ISO 9001:2015, quality control

1. Introduction

Originating A quality product is a product that has a design and characteristics that conform with established standards. This conformity is measured by the number of product failure events (defects) and the proportion of units that fail to meet specifications or standards (Garvin, 1986). One of the efforts that can be made to maintain conformity is by implementing quality control and improvement (Montgomery, 2007). Products and services must always be checked to ensure they comply with established standards and that non-compliant end results can be eliminated (Handoko, 2017). To ensure that the product meets customer expectations, the company can implement quality control in the form of inspection activities. This inspection is necessary to achieve the concept of quality (Amsari & Barus, 2024). Inspection is essential to control quality, as well as detect products that do not meet standards. This is done to comply with the

requirements in ISO 9001:2015 clause 8.1 about operational planning and control (ISO 9000:2015, 2015; Mitra, 2021).

Kaffa Indonesia is an MSME (Micro, Small and Medium Enterprises) in Bandung City that specializes in business activities in the production of Muslim clothing for women and men. In the production of this clothing, Kaffa Indonesia sets CTQ (critical-to quality) of raw materials and products as a reference for characteristics that must be met by each clothing product produced. To ensure that the CTQ is met, the company carries out a process of checking the production results which is called the quality control/inspection process (Tannady et al., 2019; Villazón et al., 2020). The inspection process divided into two, namely raw material inspection and final production result inspection. The following can be seen in Table 1.

Table 1. Critical to quality of raw material and finished product

No	Driver	Critical to Quality
1	Fabric	Type and color of fabric matched with order and delivery document
2		Fabric is not torn
3		No hole on the fabric
4		The fabric color does not fade
5		The fabric color is not streaky
6		The fabric has no lines
7	Stitches	Sewing thread does not break
8		Fabric is sewn tightly, not loose so the threads come off easily
9		Stitches evenly
10		Thread does not clump
11		Thread not pulled
12	Button	Strong button stitching
13		Buttons do not break easily when used
14	Zipper	Strong zipper stitching
15		Zipper can be used smoothly
16		The zipper head is not broken
17	Pocket	The pocket position is straight and in its proper place
18		Pockets are not punctured or torn
19	Strap	Strong rope stitching
20		Right and left strap sizes are balanced
21	Label	Label are firmly attached
22		Label placed in the center
23	Size	The length and width of the clothes are in accordance with the specified size chart

During the sales from November 2023 to April 2024, customer complaints were received indicating that the inspection process carried out was not fully effective. This is indicated by the existence of defective products that have been passed into customers. The following can be seen in Table 2.

Table 2. Customer complaints during november 2023 to april 2024 sales

No	Complaints	Percentage
1	Wrong size	42.1%
2	Messy stitches	13.2%
3	Detached logo	2.6%
4	No buckle	2.6%
5	Hollowed clothes	7.9%
6	No buttons	5.3%
7	Asymmetric clothes	2.6%
8	Oil stains on fabric	2.6%
9	Glue marks	2.6%

10	Scratches on the cloth	2.6%
11	Wrong clothes	10.5%
	Total	100%

This study aims to improve the process business of the inspection process and create a Standard Operating Procedure (SOP) for the inspection process for the inspection process of raw materials, semi-finished products, and finished products as the most possible solution to minimize the customer's complaint.

2. Methodology

In this study, improvements were made to the inspection process using the Business Process Improvement (BPI) method, with the following stages in Figure 1.

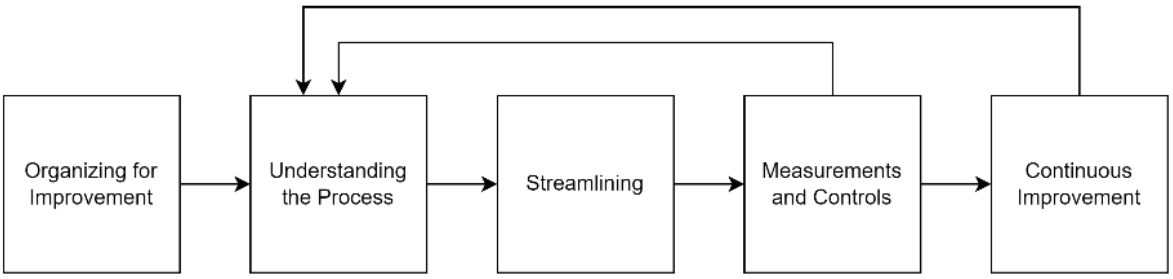

Figure 1. Business process improvement stages

Organizing for improvement, starting with analyzing the production process, inspection process, and supporting documents in the form of existing SOPs (Budirahardjo, 2014; Nancy, 2023). Problems in the existing business process were then identified using the help of a fishbone diagram. Identification of these problems resulted in critical problems that would be prioritized for improvement, namely in the inspection process with a proposed solution in the form of a draft Standard Operating Procedure (SOP). The next step was to define the initial limits of improvement, develop an improvement model, and determine measures of success.

Understanding the process, carried out by analyzing the effectiveness of the existing inspection process, identifying problems with human resources, technology, and facilities, and identifying gaps between existing conditions and the ISO 9001:2015 standard clause 8.1(Montgomery, 2007; Okes, 2009; Page, 2010). Streamlining, is carried out by applying streamlining tools. The tools used are standardization, upgrading, duplication elimination, and bureaucracy elimination.

Measure and controls, carried out by designing the Standard Operating Procedure (SOP) of the inspection process and usage of Key Performance Indicators (KPI) to measure the success of the proposed inspection process. KPI is included in the SOP draft so that monitoring and control of the process can be carried out (Indrajit & Djokopranoto, 2022; Setiawan & Purba, 2020).

3. Result and Discussion

In implementing the quality control process, the company has an SOP in the form of an inspection procedure which is only intended for the finished product inspection process. Based on actual conditions and problems that occur, fishbone diagram is used to analyze the problem which is the existence of defective products that have been passed into customers. The following can be seen in Figure 2.

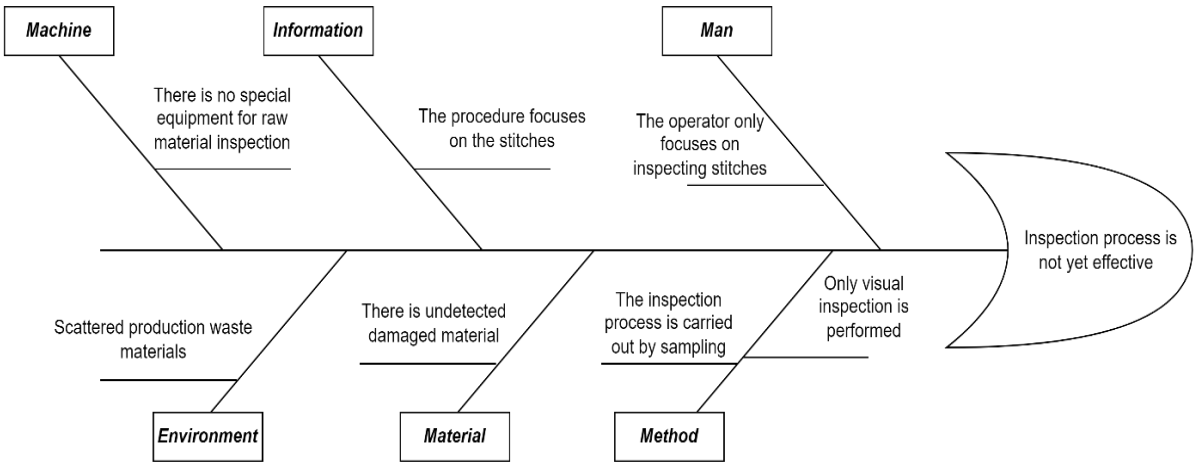

Figure 2. Fishbone diagram analysis

From the root cause analysis using fishbone diagram, the potential solutions can be analyzed. The following is the description table of potential solutions. The following can be seen in Table 3

Table 3. 5 why's analysis

Factors	Root Cause	Why 1	Why 2	Why 3	Potential Solution
Man	The operator only focuses on inspecting stitches	The operator only refers to written procedures that focus only on checking the stitches.	Operators do not take the initiative to check other factors	There are no demands or obligations from the company	Improvement of inspection procedures
Information	The procedure focuses on the stitches	The company assumes that other factors are good (starting from patterning, cutting)	Already employing experienced staff		Improvement of inspection procedures
Machine	There is no special equipment for raw material inspection	The company believes in the quality of raw materials from suppliers			Detailed raw material inspection method (inspection according to raw material CTQ)
Method	Only visual inspection is performed	The actual inspection procedure focuses only on the visual appearance of the product.			Improvement of inspection procedures
	The inspection process is carried out by sampling	The sampling process does not use an appropriate method basis			Training for operators on sampling methods
Material	There is undetected damaged material	Raw material inspection is not effective	There is no procedure		Creation of raw material inspection procedures
Environment	Scattered production waste materials	Lack of production environment management	Lack of employee awareness of the production environment		Establish a routine for organizing the production area environment

Based on the potential solution analysis using 5 Why's analysis business process improvement result is carried out by implementing 4 types of streamlining tools. From this streamlining stage, 5 activities were obtained that were carried out with 4 types of improvements, namely standardization, upgrading, duplication elimination, and bureaucracy elimination. The activities include can be seen in Table 4.

Table 4. Improvement of business process

No	Activities	Improvement
1	Conducting quality checks on raw materials	Standardization and Upgrading
2	Checking the completeness of the fabric pieces	Upgrading
3	Checking the final product according to the procedure reference	Upgrading
4	Checking the quantity of final product	Duplication elimination
5	List the products to be sent	Bureaucracy elimination

The implementation of these tools resulted in a more efficient proposed business process by reducing 2 NVA activities. So the business process consists of 12 RVA, 7 BVA, and 3 NVA which originally consisted of 12 RVA, 7 BVA, and 5 NVA. The following can be seen in Table 5.

Table 5. Proposed improvements of the inspection process

No	Activities	Process Actors	Improvement Explanation
1	Conducting quality checks on raw materials	Raw Material Inspection Staff	In this activity, standardization and upgrading are applied. Standardization is applied by creating fixed procedures for raw material inspection. This procedure in the form of SOP is expected to make the inspection process run at all times with the same procedure. The same procedure is expected to maintain the quality of the output of each inspection carried out
2	Checking the completeness of the fabric pieces	Production Staff	In this activity, upgrading is applied by proposing SOP and using checksheet form, in order to detect defects that can be immediately resolved or reworked before entering the production process (sewing). This activity needs to be developed as an effort to overcome defects from the start and prevent costs and overhead time for rework.
3	Checking the final product according to the procedure reference	Final Product Inspection Staff	In this activity, upgrading is carried out by proposing a more detailed inspection SOP in accordance with the CTQ of the product that must be inspected. In this activity, it is also proposed to record defect findings using a checksheet form
4	Checking the quantity of final product	Final Product Inspection Staff	In this activity, duplication elimination is carried out. This activity is considered a repetitive activity and does not provide added value to the product, so it will be eliminated and this activity is combined with the final product inspection activity
5	List the products to be sent	Admin	In this activity, bureaucracy elimination is carried out, namelu the elimination of unnecessary data collection activities. Product data collection activities can be carried out simultaneously with product packaging.

In addition to improving business processes, improvements were made to human resources, technology and facilities. The following can be seen in Table 6, Table 7 and Table 8.

Table 6. Suggested improvement of human resource

No	Process	Problem	Suggested Improvement
1	Raw material inspection	Lack of operator awareness of environmental cleanliness at inspection area	There is a divison of work task for supervision and management of inspection area
2	Final product inspection	Lack of operator awareness to check other factors besides stitches	Operator training on CTQ of apparel products

Table 7. Suggested improvement of technology

No	Process	Problem	Suggested Improvement
1	Raw material inspection	There is no fixed procedure for the inspection process	Create a standard procedure in the form of SOP for raw material inspection
2	Final product inspection	Existing procedures do not cover all product CTQs that need to be checked	Improving the procedure so that all CTQs that must be checked are included
3		There is no documentation of any defects found	Proposed checksheet form for documentation of defect detection results

Table 8. Suggested improvement of facility

No	Process	Problem	Suggested Improvement
1	Raw material inspection	Inspection area is inadequate	Improvement of production facilities layout

As an effort to standardize the inspection process, a draft of the SOP for the inspection process in clothing production is proposed. The SOP for the inspection process contains detailed inspection procedures based on the proposed inspection process that has been improved in the previous stage. The proposed SOP for the inspection process explains the inspection procedures with the product CTQ so that it is expected to increase the effectiveness of the inspection process, which is indicated by the accuracy of defect detection. The proposed SOP for the inspection process includes procedures for raw material inspection, semi-finished product inspection, and final product inspection. Key performance indicator (KPI) that is used to measure the effectivities of the inspection process. The following are KPIs design as a measurement reference. The following can be seen in Table 9.

Table 9. Improvement of business process

No	Purpose	Indicator
1	Improving the effectiveness of the inspection process	Accuracy of defect detection
2	Financial benefits of the inspection process	Return on investment

To support the inspection process, a draft of a checksheet form is proposed as part of the documentation of the results of defect findings. The checksheet form is presented in the form of a table containing the inspection date, inspector name, production batch, product type, defect type, defect location, number of defects, follow-up, and description. This form is filled in by the inspection operator every time a defect is found in the product during the inspection process. The data collected from this checksheet form can be used for the analysis of factors that often experience defects so that corrective actions can be taken. These corrective actions can be taken to reduce the number of defects in subsequent production. This checksheet form can be further customized to suit the needs of MSMEs.

4. Conclusion

The proposed business process can reduce errors in the form of defects that pass through to customers, thereby reducing customer complaints. Standardization of semi-finished product inspectionincreases the accuracy of defect detection, so that the probability of defective goods reaching customers is decreased. In the proposed SOP there are supporting documents in the form of checksheet forms for documentation purposes. This proposed SOP is carried out to optimize the inspection process to minimize customer complaints about clothing products produced by Kaffa Indonesia.

Suggestions for further research are based on things that have not been discussed in this study, so it is hoped that they can be studied further in the future. Further research is needed on the implementation of the ISO 9001:2015 standard in the production process other than the inspection process, as an effort to improve production quality.

Acknowledgment

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