The Success of 5S and PDCA Implementation in Increasing the Productivity of an SME in West Sumatra

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Abstract. SME X is one of the micro, small, and medium enterprises in Padang, West Sumatra, engaged in the manufacture of handmade shoes. SME X has four work stations for the production process. There were found problems related to defects in shoe products with an average of 12% per month. After identifying the causes using fishbone diagrams, problems were found related to the categories of Man, Methods, Machine, and Material, which could be solved by implementing the 5S (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke) concept and PCDA (Plan, Do, Check, Action) methods. After implementing the 5S and PDCA for one month, there was a decrease in defective products from 12% to 0% per month. Costs incurred during the implementation of the 5S and PDCA concept are Rp. 708,000, which is classified as economical because it is only done once during the implementation process and reduces losses due to defective shoe products, which were previously Rp. 1,250,000 per week to zero. It is very beneficial for the company to increase revenue and profit from sales. In terms of workers, there is an increase in productivity, and workers can work effectively, comfortable, safe, healthy, and efficient.

1. Introduction
Micro, Small, and Medium Enterprises (MSMEs) in Indonesia have a huge role in the movement of the Indonesian economy because it accounts for 60.34% of the country's Gross Domestic Product (GDP) and employment up to 97% [1]. One of the products from the MSME sector that has an increasingly high demand is shoes. At present, the demand for shoes is not just a primary need. Shoes can be used as a fashion when looking and express themselves to the community environment. Currently, shoe exports are dominated by large-scale companies, while the domestic market is mostly cultivated by small and medium industries in the form leather shoes and formal shoes for work. The leather, footwear, and finished leather goods industry is given priority in its development because it can make a significant contribution to the national economy.

One of the problems often faced by MSMEs in Indonesia is the production process, especially the availability of equipment. It is caused by limited capital and the amount of production. Besides, it is often found that the work environment is dirty and uncomfortable and affects work productivity. In terms of human resources, workers still do not care about work safety due to a lack of socialization and workplace safety training.

One of the MSMEs facing this problem is SME X. SME X, one of the MSMEs in the city of Padang, West Sumatra, which is engaged in handmade shoes. This shoe business makes various types of shoes, such as work shoes, police shoes, casual shoes for men, and women made of 100% genuine cow leather.
This business has an owner and one employee. The owner is in charge of the business manager while making shoe patterns, and another employee is in charge of sewing upper, lasting, assembly, and finishing shoes. Employee working time is five days a week, starting from Tuesday-Saturday, with a working time flexible. Make to Order (MTO) is a strategy used by SME X to produce shoes because the average consumer orders shoes according to the desired model.

SME X has four work stations, namely: Design and Pattern that functions to design patterns on paper glue that are attached to shoe molds; Tailoring, which is a work station for sewing pieces of cowhide in the shape of the pattern using threads to form the upper of the shoe; Lasting and Assembly is a work station to unite the upper and bottom and a grinding process is performed to smooth the edges tread for neat and orderly shoes; Finishing and Inspection, which functions to spray the upper and lower parts of the shoe and inspect it to avoid defective products.

In the last three months, there have been defective shoe products per month, with an average of 7 products (12%) out of the total monthly production of 60 pairs of shoes. It causes a decrease in profit every month as much as Rp. 1,250,000. Product defects that occur in shoe products at SME X include shoe size, not following customer demand, untidy stitches, cracked skin, and dirty footprints. Therefore it is necessary to do an analysis that serves to identify the causes of the occurrence of defective products that can cause harm to the company.

Based on the preliminary observations on every workstation in SME X, problems were found, especially in the work area, work equipment, and the absence of Standard Operating Procedures in each work station. The results of observations of the initial conditions of the work area in SME X are presented in Table 1.

| No. | Work Area Conditions | Yes | No |
|-----|----------------------|-----|----|
| 1   | There are equipment and items that are not needed in the work area. | ✓   |    |
| 2   | Equipment and goods are arranged neatly. | ✓   |    |
| 3   | All items have a special place. | ✓   |    |
| 4   | Equipment and goods have labels/markers. | ✓   |    |
| 5   | There is a lack of stacking of material and equipment in the work area. | ✓   |    |
| 6   | There are equipment storage racks. | ✓   |    |
| 7   | Workers understand the 5S principle. | ✓   |    |
| 8   | The work environment is clean. | ✓   |    |
| 9   | There are cleaning equipment. | ✓   |    |
| 10  | There is a person in charge of cleanliness at each workstation. | ✓   |    |
| 11  | There is a Standard Operational Procedure (SOP) at work. | ✓   |    |
| 12  | There are habitual disciplinary actions for workers. | ✓   |    |

Table 1 shows that the work area's condition still mainly does not meet proper standards to support workers to do work. It can have detrimental effects such as inappropriate tools found in the work area that cause workers difficulty finding the equipment sought and time wastes. Besides, there is no clear SOPs in each workstation. It can be one of the possible causes of shoe defects.

Thus, the main problem faced by SME X is related to 5S (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke) problems that almost occur in all workstations and other areas. The concept of 5S is a method applied to create a neat, clean, comfortable work atmosphere that aims to increase work productivity [2]. Seiri aims to get rid of items that are not needed so that there are only items that are really needed in work activities in the workplace. Seiton is everything must be placed according to the specified position so that it is ready to use when needed. Seiso is an activity to clean equipment and work areas so that all work equipment is maintained in good condition. Seiketsu is an activity to maintain personal hygiene while complying with the three previous stages. Shitsuke is the maintenance of the personal discipline.
of each worker in carrying out all stages of 5S. The Plan, Do, Check, Action (PDCA) method has several stages, namely: Plan (problem identification, problem specification, and data collection), Do (implementing), Check (comparing conditions before and after implementation), and Action (carrying out evaluations and actions to maintain the results of improvements).

Several previous studies used the 5S concept and PDCA method to improve the work environment while reducing defective products [3-10]. These studies use the 5S concept and the PDCA method to correct problems in terms of equipment sorting, equipment positioning, equipment cleanliness, and equipment maintenance, worker discipline, improving product quality, and reducing defective products. So that companies are the case studies it can increase productivity in all aspects.

Therefore, this study aims to implement the 5S concept and PDCA method and evaluate the implementation of the 5S concept and PDCA method in the production floor area at SME X in Padang, West Sumatra.

2. Method

2.1. Observation
Observations were conducted to observe all workstations in the production floor area in order to know the problems that occur, data collection that is needed and socializing 5S concepts to workers.

2.2. Interview
Interviews were conducted with owners and employees whose aim was to ask what problems occurred in the SME X production floor area.

2.3. Documentation
Documentation was carried out in the form of taking photos that aim to compare the production floor area before and after implementation.

2.4. Implementation of the 5S concept
The stages carried out in implementing the 5S concept in the production floor area at SME X are as follows:

- Obtain data on problems in each workstation, collect data on equipment, and workers already know the 5S concept.
- Plan implementation of the 5S concept. A plan is made to improve the production floor area and minimize defective products by implementing the 5S method and the PDCA method.
- Do the 5S concept implementation [11]. The design and improvement of the 5S concept were carried out in the production floor area at SME X. Seiri (Sort) - At this stage, sorting out unnecessary equipment and goods so that there is only equipment and goods that are really needed in the work activities; Seiton (Set in order) - At this stage, everything must be put in its appropriate position; so that it is ready to use when needed by providing storage containers and shelves and labeling; Seiso (Shine) - At this stage, the activity of cleaning equipment and work area so that all work equipment is maintained in good condition. By cleaning all workstations, a three-step design starts from macro, individual and micro activities; Seiketsu (Standardize) - At this stage the activity of maintaining personal and environmental hygiene while complying with the three previous stages through the SOP; Shitsuke (Sustain) - At this stage the maintenance of each other's discipline workers in carrying out all stages of 5S.
- Check the results of the implementation of the 5S concept. At this stage, a comparative evaluation is carried out before and after the implementation of the 5S concept to find out whether what was done was successful or not.
• Action (Prevention) possible implementation fails. At this stage, make a list of possibilities that can cause the failure of the implementation of the 5S concept as well as countermeasures that can prevent these failures.

3. Results

3.1. Observation results before implementation
At the design and pattern work station, work is carried out on the table with tools such as scissors, pens, masking tape, paperboard, cutter blades, and cutting mat for materials such as cloth or paper. At this work station, problems were found, such as workers not being able to work freely because the area on the desk contained equipment or goods that were not related to the design and patterning process, which resulted in narrowing the movement of workers. Besides, workers were difficult to find the equipment needed because it was not put in place.
At the tailoring work station, work is carried out using a sewing machine that functions to unite or sew pieces of shoe leather according to a pattern that has been made. The station is equipped with fluorescent lighting for sewing at night. At this workstation, problems found include unsafe working environment conditions due to the discovery of the remaining material such as threads, needles, and scissors that, when stepped on, can injure workers. Also, the position of the thread is not ergonomic because it is under the table can cause back pain because they have to bow when reaching the thread. The power cable position is also messy, which can endanger the lives of workers if electrocuted.
At the lasting and assembly work stations, the work carried out is the process of pulling up the upper shoe and joining the upper and bottom shoes with the help of tools such as hammers, special leather scissors, special leather knives, special pliers, blower (leather heaters), and press machines that function to joining the upper and bottom of the shoe with the help of hydraulic power. This work station is equipped with lighting in the form of fluorescent lights, which functions make it easier for workers to do work at night. The problems found were that workers felt uncomfortable because there were stacks of goods which hindered the movement of workers, the presence of sharp objects around the work area, as well as piles of dust in the grinding area, which resulted in shortness of breath.
The finishing and inspection work station functions as a place for spraying shoes with the help of a compressor spraying liquid cleaning fluid on shoes, a place to install product labels that are useful as the identity of the shoe-making company, and a place for packing shoes if it has passed all stages of production. At this work station, the problem faced is that the available work table is too small due to other objects placed on the work table. At this work station, there is also a shoe mold rack that functions as a storage medium so that it is easy to find and does not require much space. However, the shelf is a mess, and the mold is not described as the size and type of shoes. It results in the length of the process of finding the desired shoe mold. Besides, there are also shoe pattern design hangers with the position hanging on the wall of the building. However, no sign can distinguish the types of shoe pattern designs, making it challenging to find the type of pattern according to shoe orders (Figure 1).

3.2. Fishbone diagram
Fishbone diagrams are used to identify the causes of defects in shoe products. Defects found include: Shoe size does not match consumer demand; uncluttered stitches; cracked skin; and untidy tread edges. Table 2 shows the causes of defects that occur based on the results of the analysis using a fishbone diagram.
Table 2. Recapitulation of the defect causes

| No. | Category    | Problem                                                      |
|-----|-------------|--------------------------------------------------------------|
| 1   | Man         | Workers are careless, miss-communication, unfocused         |
| 2   | Method      | There is no Standard Operational Procedure (SOP)            |
| 3   | Measurement | There are no periodic maintenance                           |
| 4   | Machine     | There are no standard measurements                          |
| 5   | Material    | Materials accumulate and do not fit in place                |
| 6   | Environment | Dirty work area                                              |

3.3. Implementation of the 5S Concept

3.3.1. Seiri (Sort). At this stage, the sorting of equipment and useless goods was conducted so that there is only equipment and goods that are really needed in the work activities. A red label (akafuda) is given to the useless items to be thrown away or moved. Equipment and goods in good condition will be collected and reassembled at the storage place.

3.3.2. Seiton (Set in order). This stage aims to arrange the goods and equipment used, so it is easy to find and recognize by the workers who use it by: (1) Designing equipment containers and racks. Figure 2-6 shows the required container and equipment rack designs; (2) Giving name tags to help workers find the items needed.

3.3.3. Seiso (Shine). At this stage, the work area must be cleaned from all rubbish, dirt, and foreign matter when the work has been completed to create a clean, safe, and comfortable environment.

3.3.4. Seiketsu (Standardize). To run and maintain the previous 3S (Seiri, Seiton, Seiso) must be standardized. Standardization is an effort made to maintain and improve the performance achieved and minimize the occurrence of defective products on shoes. It was conducted by developed a Standard Operational Procedure (SOP) for work.

3.3.5. Shitsuke (Sustain). Shitsuke is disciplined or implements the ability to do things the way they should, running the previous 4S continuously and making this activity a habit and a necessity in everyday life. After finishing work, the steps that must be taken to implement discipline are AYO 5S activities such as putting the equipment in its original place, following the steps in the shoe making.
process according to the SOP, and cleaning the work area. Every worker must fill out the AYO 5S form after they finish working. If the worker does not do this, a reprimand will be made.

Figure 2. Leather storage container design

Figure 3. Leather waste storage and shoe pattern container design

Figure 4. Shoe soles container design

Figure 5. Yarn rack design

Figure 6. Shoe Mold Rack Design
4. Discussion

4.1. Check the results of 5S implementation
At this stage, comparative evaluation is carried out before and after the 5S implementation to determine whether successful or not.

4.1.1. Comparison of the number of defective products. Before the 5S concept was implemented, every week in the last three months (April-June) 2019, there were as many as 20 shoe defects. After implementing the 5S concept for one month, no defects were found in the shoes. A decrease in the number of defects in one month occurs after repairing the work area and making SOP anticipate the occurrence of product errors or defects during the production process. It is following Hartatik [12] suggestion, which states that one of the objectives of making SOP is to anticipate failures or mistakes and reduce waste in implementing activities. Listiani [13] states that when the 5S method is applied correctly and adequately, it will have a positive impact on the company, such as minimizing workplace accidents and defective products. Therefore it can be seen that the implementation carried out can reduce the occurrence of defective products.

4.1.2. Comparison of work environment conditions. Table 3 shows the comparison before and after implementing the 5S concept in the SME X production floor area.

| No. | Work area conditions | Before | After |
|-----|----------------------|--------|-------|
| 1   | Equipment and items that are not needed in the work area. | √ | √ |
| 2   | Equipment and goods are arranged neatly | √ | √ |
| 3   | All items have a special place. | √ | √ |
| 4   | Equipment and goods have labels/markers. | √ | √ |
| 5   | There is a lack of stacking of material and equipment in the work area. | √ | √ |
| 6   | There are equipment storage racks. | √ | √ |
| 7   | Workers understand the 5S principle. | √ | √ |
| 8   | The work environment is clean. | √ | √ |
| 9   | There are cleaning equipment. | √ | √ |
| 10  | There is a person in charge of cleanliness at each workstation. | √ | √ |
| 11  | There is a Standard Operational Procedure (SOP) at work. | √ | √ |
| 12  | There are habitual disciplinary actions for workers. | √ | √ |

4.2. Action
One of the factors causing shoe defects is decreased worker productivity. Factors that affect worker productivity include poor communication between workers, dirty work areas, no periodic machine maintenance, and materials that accumulate in the work area. Therefore, SOP is needed to prevent defects in shoes. There are other ways to prevent mistakes when working, by making a list of possible implementations and failure prevention measures [14]. Those lists and actions are presented in Table 4. The list and actions have been validated by SME X and can be used as a new standard in the shoe-making process.
4.3. Economic analysis
Cost is one of the factors that can support the successful implementation of 5S and PDCA. Table 5 shows the details of the costs incurred. The costs incurred for implementing 5S and PDCA amounted to Rp. 708,000. The cost is profitable because it is only done once during the implementation process. It minimizes losses due to defective products. Before the repairs, the costs incurred were Rp. 1,250,000 per month and after implementation became zero because no defects were found in shoe products. Therefore, it is very beneficial for the company to increase revenue and profits from sales from an economic perspective. It is consistent with Handoko [7] research that the application of the PDCA method is good for the company in terms of the economy because it can reduce the amount of loss due to product defects.

Table 4. List of possible implementation failures and failure prevention actions

| No. | List of possible implementation failures                                      | Failure prevention actions                                                                 |
|-----|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| 1   | Workers forget or are lazy to clean the work area and dispose of garbage periodically even though it is stated in the SOP | Provide sanctions in the form of reprimand, and if it continues it will be reduced rations, add the display related to cleanliness and throw garbage |
| 2   | Workers do not focus on doing work because while doing other activities.     | Provide sanctions in the form of reprimand, and if it continues it will be reduced rations |
| 3   | Engine failure has occurred                                                   | Perform regular maintenance, report the possibility of damage, and buy parts that must be replaced, and add displays related to proper and correct engine maintenance |

Table 5. Cost details for 5S and PDCA implementation

| No. | Purchase list       | Price (Rp.) | Total | Total Price (Rp.) |
|-----|---------------------|-------------|-------|-------------------|
| 1   | Rack support bracket iron | 7,000       | 2     | 14,000            |
| 2   | Print labels and akafuda | 1,000       | 13    | 13,000            |
| 3   | Masking tape        | 5,000       | 1     | 5,000             |
| 4   | Cardboard           | 500         | 2     | 1,000             |
| 5   | Glass               | 25,000      | 1     | 25,000            |
| 6   | Shoe rack           | 650,000     | 1     | 650,000           |
|     | Total               |             |       | 708,000           |

4.4. Worker impact analysis
After implementing the 5S and PDCA concepts in the SME X production floor area, changes occur that have a good impact on workers. The changes are: (1) Workers can do work freely and comfortably because sorting equipment and items are needed; (2) Workers become safer and healthier because safety tools have been provided in the form of masks and protective glasses to avoid the rest of the material entering the eye and inhaling into the lungs; (3) Workers become more effective and efficient at work because containers, racks, and name tags have been provided so as to facilitate and reduce the movement of searching when looking for equipment and items needed. This is in accordance with Supriyanto [15] research, which states that the implementation of the 5S has a positive and significant effect on increasing work productivity.
5. Conclusion
Problems that occur in the SME X production floor area is that there are defective shoe products at 12% per month. The results of the identification found that it was caused by the carelessness of the workers at work, the absence of SOPs, the absence of periodic engine maintenance, equipment and items piled up and placed out of place, and dirty work areas. Improvements were made by implementing the 5S and PDCA methods. Based on the evaluation results after the implementation of 5S and PDCA in SME X for one month, there was a decrease in defective products from 12% per month to 0%. Also, there is a change in a better work environment that has an impact on increasing worker comfort and safety. The cost incurred to implement the 5S concept is Rp. 708,000, which is classified as economical because it is only done once during the implementation process and can reduce defective shoe products that were previously Rp. 1,250,000 per month to zero. Therefore, the implementation of the 5S and PDCA concepts provides a positive impact on the company both in terms of comfort or safety of workers and in terms of the company's economy, thereby increasing company profits.

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