Productivity Improvement In Car Detailing Process At Java Detailing Workshop With Mepis Productivity Cycle

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Abstract

As the automotive world in Indonesia has progressed, car vehicles are starting become a hobby item, car hobbyists consider their car is a life partner and want their car always in the best condition in terms of engine, interior, and exterior. In maintaining the condition of the interior and exterior, one solution is to use car detailing services, Java Detailing Workshop is a workshop that provides car detailing services to make the interior and exterior conditions return to prime after only being used for a while. As the number of car hobbyists in the Jabodetabek area grows, the workshop cannot meet the increasing demand for car detailing services every month so currently the company uses a reservation system and customers have to wait until the customer can be served after the customer has completed the reservation. To solve this problem, this research was made using the MEPIS productivity cycle method so that companies can increase their productivity in a sustainable manner assisted by an Objective Matrix to measure productivity and assisted by Fishbone Diagrams in conducting evaluations. It was found that the factors that affect productivity are the energy use and working time of each car, the improvements made in the fields of humans, machines, methods, and the environment with the results of electricity usage efficiency of 28% and car detailing time efficiency of 6% which can add service capacity one car per month.

Keywords
Productivity, MEPIS, Objective Matrix, Fishbone Diagram, and Car Detailing.

1. Introduction
Along with the development of four-wheeled private vehicle users in Indonesia which can be seen in Figure 1, four-wheeled vehicles are now for some people a hobby where the car is not only a means of transportation that takes users

from point A to point B but also a life partner who can make users happy. and most of them will take great care of their car, from the engine sector to the car body.

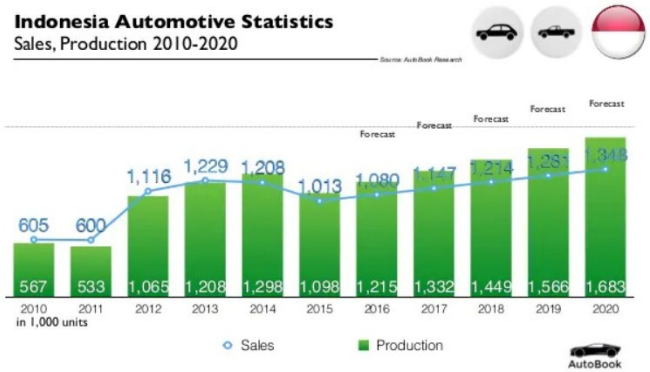

Figure 1. 2010-2020 car sales statistics

With the increasing number of car users in Indonesia, car washing is one of the activities to clean the car body from dirt that sticks after a long time of use and it is one of the most common car treatments and must be carried out by all car owners, but many car users do not have time or are lazy to do their own car wash and prefer to use a car wash service. As time goes by, more and more workshops provide car washing services, from lower-class car washes that only do regular washing to high-end car washes that do detailed washing and have a variety of other complementary treatments such as cleaning the interior to the engine room, known as the car detailing.

Now there are many workshops that provide car detailing services in Indonesia, both from middle to upper class car detailing which have more premium maintenance in terms of equipment and washing methods, and now there are also car detailing and ceramic coating services that aim to clean and polish the car to be more shiny than the car when it was new. Java Detailing Workshop is a one stop service workshop that provides a variety of car maintenance, from engine maintenance to car beauty care and car detailing and ceramic coating are one of the services offered. The Java Detailing Workshop itself has 3 service package options, the following are the service packages provided by the Java Detailing Workshop, namely :

1. Basic Guard (Car Detailing and Ceramic Coating Quartz with a service life of 2 years, gloss level 8 out of 10)
2. Medium Guard (Car Detailing and Ceramic Coating Quartz+ with a service life of 3 years, gloss level 9 out of 10)
3. Maximum Guard (Kenzo Car Detailing and Ceramic Coating with a service life of 5 years, gloss level 10 out of 10)

The three packages are divided into 4 categories that are adjusted to the size of the prospective customer's car, consisting of small, medium, large and extra large. The service package is offered to potential customers and the prima donna of the services provided are car detailing and ceramic coating for medium size cars which have the highest demand of up to 50 cars per month.
However, the large demand is not matched by the service capability of the Java Detailing Workshop which is only able to serve 30 cars per month and makes these services now use a pre-order system where the average waiting list for car detailing and ceramic coating services is 20 cars. . For more detailed data regarding services from the Java Detailing Workshop, see Table 1.

Table 1. Java Detailing Workshop Service Report for the period November 2020 – October 2021

Car Detailing Service Monthly Service Report at the Java Detailing Workshop												
	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21
Demand	48	54	51	51	49	52	49	47	48	49	49	50
Served	27	26	28	30	29	29	29	27	27	29	28	28

Queue / Unserved	21	28	23	21	20	23	20	20	21	20	21	22

When viewed using Google Maps with a radius of 50 kilometers, there are at least 13 competitors who offer car detailing services so that by increasing the service capacity, you can reduce the total queue and reduce the possibility of customers switching to competitors. The existing condition of the Java Detailing Workshop itself already has an SOP for each service they provide, but according to the owner, the existing SOP is not optimal and can still be optimized further. According to the author, optimization can be done using the MEPIS (Measurement, Evaluation, Planning, Improvement, Sustainable) method assisted by the Objective Matrix method in the measurement process, and the Fishbone Diagram method in the Evaluation process.

1.1 Objectives

The following are the research objectives to be achieved in this final project are as follows:

1. Knowing the factors that most affect productivity in the car detailing process and identify what jobs can be given improvement in the car detailing process
2. Knowing the lowest and highest productivity levels of the factors that most affect productivity in the car detailing process in the period November 2020 to October 2021
3. Provide recommendations for improvement to the company to optimize work in the car detailing and ceramic coating process and increase productivity and monthly service capacity

2. Literature Review

Car detailing is an activity or technique in vehicle maintenance that aims to beautify the appearance of the vehicle both in terms of interior and exterior. Car detailing activities are mostly carried out by users of four-wheeled vehicles once a year in order to recondition the condition and cleanliness of the car to be like new, both in terms of cleanliness outside the car, cleanliness of the engine room and cleanliness inside the car cabin in order to stay comfortable. In use, this car detailing activity can be carried out by car users themselves or using the available car detailing services. The car detailing process has three stages, namely:

1. Cleaning
   a. Exterior Detailing
      It begins with washing the car's exterior which is carried out thoroughly and carefully so that the paint of the car being washed is not scratched by fine dirt, in this process the car is washed using the two bucket method using two buckets one bucket for soapy water and another bucket for clean water which aims to minimize the dirt from the car body will stick to the foam and when washing the dirt can make fine scratches on the car. This exterior washing is carried out on the entire exterior of the car, starting from the body, under, the legs, wheels, exhaust, small parts that are rarely cleaned such as emblems and the corners of the car that are difficult to reach. closed by rinsing the car with clean water. After washing the exterior, continued with the use of clay which aims to remove the remaining dirt that has been attached to the car body by rubbing the clay onto the car body in a wet condition so that the dirt attached to the car body will be lifted by the clay. After all these processes are complete, then the drying process is carried out to dry the car after washing.

   b. Engine Detailing
      At this stage, cleaning of the engine room is carried out which aims to clean the dirt that is in the engine room and engine exterior such as dirt, dust, liquid seepage, water scale, and other impurities that are inside. engine room and engine exterior. After the dirt is clean, then a touch up process is carried out on the exterior of the machine to recondition the exterior condition of the engine so that it looks clean like new, this process takes approximately 45 minutes.

   c. Interior Detailing
      cleaning the interior of the car thoroughly starting from removing the additional carpet (if any) and the basic carpet of the car which will then be set aside for washing, then dismantling the interior panels which aims to be able to vacuum the car interior thoroughly to get to the corner under the seats and between the doors, then cleaning the door panels, dashboard, steering wheel, and transmission panels. Furthermore, cleaning the seats using a vacuum spray extraction if using fabric seats, while for cars using leather seats,

they will be cleaned using a special liquid and then brushed. The last is the process of polishing the interior of the car that has a paint layer, such as the door panels, the panels around the gears, and other parts that have a paint layer.

2. Paint Correction
   In this process, preparations are made on the car paint which aims to restore the original color of the car paint by lifting or scraping the varnish layer (clear coat) that is dull or has smooth scratches by polishing it using a polishing machine. (polisher) is a special that has a circular motion that moves left and right and is assisted by using a special chemical liquid that can help to scrape off the dull varnish one to two microns thick so that the remaining varnish condition is only the part of the varnish that is still clean and clear without dirt and scratches. Even the smoothness has disappeared because the condition of the varnish has been leveled in this process, so that it can make the car paint color brighter and remove most of the fine scratches on the clear coat from the paint.

3. Ceramic Coating
   In this process, a ceramic coating is applied, which is a chemical liquid that is applied over the clear coat layer, which previously had been partially removed in the paint correction process so that there was a thinning of the thickness on the clear coat. The application of this ceramic coating itself can be done in several layers, depending on the package. what is chosen by consumers or what packages are provided by ceramic coating service providers, generally consumers choose to use ceramic coatings with a thickness of one layer because the price is more affordable, but not a few consumers with more premium cars will usually choose to request ceramic applications coating with a thickness of two to three layers for better protection and shine against the paint of their car.

Umar (1999) **Productivity** is a comparison of the results achieved (output) with all the resources used to achieve the results (inputs). The following is a formula for productivity:

$$\text{Productivity} = \frac{\text{Effectiveness produces output}}{\text{Effectiveness using input}}$$

Meanwhile, according to Heizer et.al (2005) productivity is the ratio of the output of a system to the inputs used to produce an output. Within the scope of production or service inputs are labor, materials, energy, and capital. While the output is a product or service obtained from a variety of resources used.
From the definition stated above, it can be concluded that the company needs to pay attention to how they can convert inputs into outputs where the output can be in the form of a manufactured product, goods sold or services provided to customers. Output is something that is important because without output it means that the activity does not include productivity.

Summanth (1985) there are many advantages that can be obtained from an increase in productivity in the company. There are elements that are interrelated with productivity, including company profits, operational costs, worker income, and product selling prices. Figure 2 shows the relationship between elements and productivity.

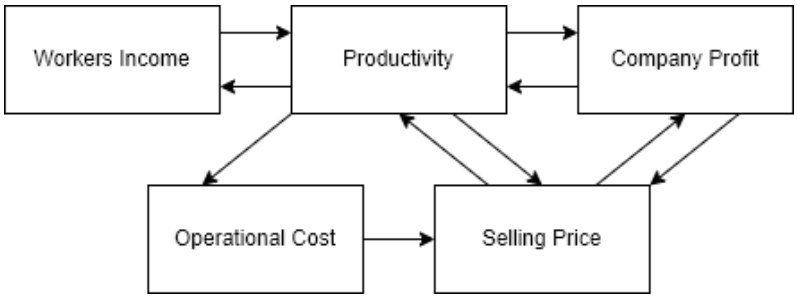

Figure 2. Productivity Benefit Model

1. Worker Income

When workers contribute to increasing work productivity for the company, then these workers will get an increase in income that is adjusted to the increase in productivity generated by these workers.

2. Operational Cost
   Increasing worker productivity for companies can streamline operational costs which with the same operational cost budget but workers can produce greater output. With this happening, the company can save operational costs because with the same operational cost budget it can produce greater production.

3. Company Profit
   When workers have high productivity, the company can produce greater output, so that the cost per unit is lower and this can increase the profit earned by the company.

4. Selling Price
   When the operational cost budget remains the same but can produce a larger output, the cost of goods manufactured per unit will be lower. This is an advantage for the company because with the selling price of the same product or service but the cost of goods manufactured per unit is lower then the profit margin of the company will increase, or the company can also lower the selling price with the same profit margin that has been adjusted to the cost of goods manufactured per unit so that the company can superior to competitors in terms of selling price and can increase sales figures.

The following is the formula for the Productivity Benefit Model:

$$\frac{Price}{Unit} = \frac{Cost}{Unit} + \frac{Profit}{Unit}$$

Productivity measurement is an important management tool to be applied at all levels of the economy. The relationship between productivity measurement and productivity changes is to be able to evaluate the efforts that can be made to increase company productivity. For the measurement of productivity itself, it can be used as input to the company's strategic decision makers. Productivity measurement aims to be able to assess whether the efficiency of the company's productivity has increased or decreased which is useful as information in formulating a company's strategy to be able to compete with competitors. Therefore, each company has its own way to achieve high productivity, some rely on technology and some rely on human resources.

Summanth (1985) the **productivity cycle** has four stages which are often shortened to MEPI, which consist of:
1. Measurement of productivity (measurement)
2. Productivity evaluation (evaluation)
3. Productivity planning (planning)
4. Increased productivity (improvement)

Often after productivity improvements are implemented, management or employees are not careful and cause productivity to decline again. So that productivity does not decrease again, it is proposed to add stages, namely maintaining productivity, with the addition of stages, the productivity cycle becomes five stages and changes the abbreviation to MEPIS. The following is an overview of the MEPIS productivity cycle:

1. Measurement
   Productivity measurement is useful for knowing the level of the company's existing productivity or what has been achieved after improvements have been made to the previous process. When measuring productivity, there are several approaches that can be taken to compare the level of productivity which is distinguished from several factors, namely:

   a) Measure basic period work units to compare work units per period
   b) Measure other company units to compare company work units
   c) Measuring the achievement of the targets that have been set to compare current work units

2. Evaluation

Productivity evaluation is carried out to find out whether there is an increase or decrease in the level of productivity in the company's existing conditions, without conducting an evaluation, the assessment of productivity measurement becomes biased because it cannot know whether the measured productivity value is good or not.

Productivity evaluation is done by comparing several productivity that has been measured based on the following, namely:

a) Productivity of the current period
b) Work productivity of the previous period
c) Work productivity in other organizational units in the same company
d) Targets that have been set
e) Productivity planning

3. Planning

Companies that do productivity planning generally have planning programs that are in a better position to increase competitiveness when compared to companies that don't do productivity planning. The benefit of productivity planning is that there is clarity regarding the goals or targets to be achieved either from each existing activity or as a whole, so that the company can find out whether they are approaching the set targets or not.
Productivity planning is distinguished from the time span, be it long term or long term. Long-term productivity planning covers a period of more than one year, while short-term productivity planning generally covers a period of one year or less than one year.

4. Improvement

The increase in productivity aims to carry out productivity planning from the previous period. The increase in productivity is different from the planning that has been done because it has several causes, namely:

a) At the time of planning, the assumptions used changed so that the implementation of increasing productivity could not go according to plan
b) At the time of increasing productivity, the work environment is not in accordance with the conditions of the work environment at the time of planning such as the occurrence of regulatory changes.

5. Sustaining

Maintaining productivity aims to keep productivity levels from decreasing in the future, in maintaining productivity it is necessary to maintain various factors that can increase productivity, monitor performance on an ongoing basis and take immediate action if there is the slightest decrease in productivity.

Objective matrix (OMAX) is a partial productivity reduction system which was later developed in order to be able to see the level of productivity in each unit in the company by taking into account the conformity of the productivity criteria with the presence of the unit. OMAX has the characteristics of performance criteria in working groups that are united in a matrix where each performance criterion has a target, namely a special path for improvement and has a weight that is adjusted to the level of priority to the goal of company productivity, the final result of the OMAX measurement is a single value to the work group.

Activities of all company personnel need to participate in assessing, improving, and maintaining the performance of their units because OMAX is a measurement system that is assessed directly to each part or unit in the company. The following are the functions of OMAX, namely:

1. Means of measuring productivity
2. Tools for solving productivity problems
3. Monitoring tool to monitor productivity growth

The following are important aspects of OMAX, namely:

1. Awareness
   Awareness in realizing the importance of productivity and increasing productivity
2. Improvement (Improvement)
   Improvements to parts or units that have decreased productivity by making improvements
3. Maintenance (Maintenance)
   Maintenance in maintaining productivity levels

OMAX has a unique basic structure, the following is the structure of the OMAX model, namely:

1. Productivity Criteria
   Contains activities and factors in the unit whose productivity will be measured and the measurement is expressed by the ratio of the productivity to be measured
2. Performance or Achievement Value
   Contains the value of each productivity based on the last measurement
3. Level
   Contains values that show performance based on measurements of each productivity criterion with levels from 0 which means the worst value to 10 which means the target value. For normal levels are at level 3
4. Score
   Contains the results of performance measurements that are converted into scores
5. Weight
   Contains the level of importance written in units of percent (%) with a total of 100%, the weight indicates the importance of these criteria to the productivity of the measured work unit
6. Value
   Contains the value of the achievements that have been achieved from each criterion in a certain period obtained by multiplying the scores on the criteria being assessed
7. Performance indicators
   Contains the sum of each productivity index calculated as a percentage increase or decrease from current performance

The following is an example of an objective matrix table for:

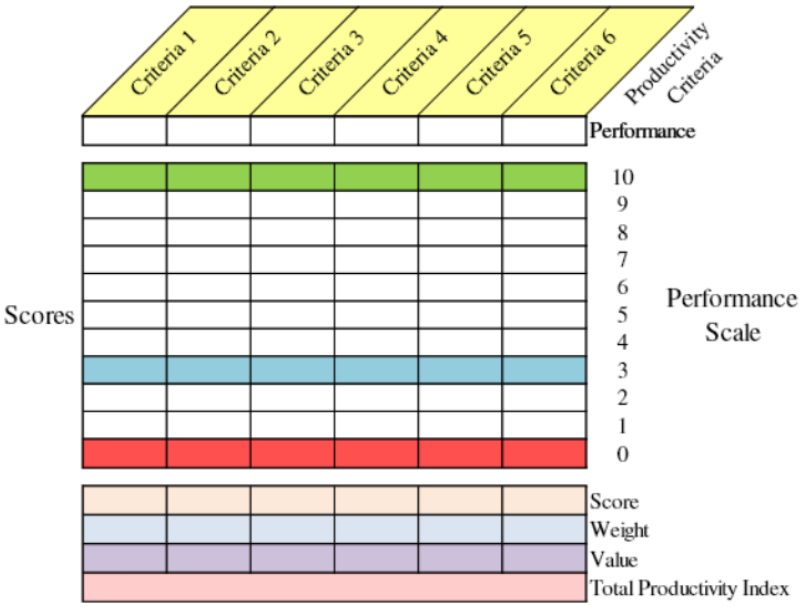

Figure 3. OMAX Table Format

Fishbone diagram is one of the 7 tools created by Dr. Kaoru Ishikawa is a Japanese scientist born in 1915 in Tokyo, Japan. It is called a fishbone diagram because it has a shape similar to a fishbone with a fish head as a result of the collection of bones in the fish's body which contains various causes from several existing factors, therefore a fishbone diagram can also be referred to as a cause and effect diagram. . Fishbone diagrams can help organizations to find detailed problem solving to the root of the problem, in making or identifying fishbone diagrams it is better to do it together with all members so that they can have many points of view and opinions as considerations to find out why these problems can occur. and what are the solutions to reduce or eliminate these problems.

3. Methods

Observation and Focus Group Discussion

In this method writer made direct observations to the object of observation to see firsthand how the car detailing process took place at the Java Detailing Workshop so that the author could find out the real conditions in the field. And the author conducted a Focus Group Discussion with parties from the Java Detailing Workshop to get information in the field from the point of view of the Java Detailing Workshop and experts from the car detailing field.

Productivity Index Calculation

The process of calculating the productivity index is carried out by taking into account the partial productivity index and the total productivity index from each monthly data that has been taken by the author.
The following is the calculation formula used in this study for the calculation of parisal productivity and total productivity :

$$\text{Labor Partial Productivity} = \frac{\text{Output in month X}}{\text{Input labor in month X}}$$

$$\text{Energy Partial Productivity} = \frac{\text{Output in month X}}{\text{Input energy in month X}}$$

$$\text{Total Productivity} = \frac{\text{Output in month X}}{\text{Input in month X}}$$

X = Is the umpteenth month calculated

The process of making the Objective Matrix (OMAX) begins with determining the productivity criteria, in determining the productivity criteria must be in accordance with the unit being measured. Determination of productivity criteria is better with more than one number of criteria because they must represent the overall productivity in the unit. Next, determine the target value and weight of each unit in the car detailing process at the Java Detailing Workshop, the target to be achieved must be realistic by looking at the current state of the company, as well as for the weight value itself is the priority level of the predetermined criteria and value. weights use percent (%), for the total value of the weights of all existing criteria is 100%.

Next, perform a measurement which divides the value indicating the level at which the measurement matrix will begin, if the value is less than the minimum acceptable result then that value can be considered zero (0), for the measurement results of each unit to be developed need to be included in the input that can be recorded at levels 3 to 10, and for all inputs is the result of the interpolation of the three rows for each of the existing criteria.
The following is the calculation formula for level increase, namely:

$$\text{Interpolation of increments of level 1 and 2} = \frac{\text{Level 3} - \text{Level (X} - 1)}{3 - (\text{X} - 1)}$$

$$\text{Interpolation of increments of level 4 until 9} = \frac{\text{Level 10} - \text{Level (X} - 1)}{10 - (\text{X} - 1)}$$

X = Is the umpteenth month calculated

The last step is monitoring, the results of the comparison of the ongoing process can be placed at the top of the matrix which is then matched with the level of the body of the matrix, then recorded on the row of values based on the existing values. If there is a comparison between the two levels, then the one with the lowest value is chosen. Furthermore, the priority of each criterion is a weighted line, where the value in the weight line is multiplied by the value above it and then written on the X-weighted value line, from the weights that have been multiplied it produces a performance indicator for each calculated period.

Fishbone diagram begins with determining what factors will be seen or considered in a division or on a problem and has no boundaries, but in general for making fishbone diagrams refers to 5M factors (Man, Machine, Material, Method, Measurement) and environmental factors (Environment). In this final project the author will focus on the Man, Machine, Material, Method, and Environment factors because according to the author these five factors are relevant to the object of observation. The use of fishbone diagrams in this final project will help find and evaluate the problems that exist in the car detailing process at the Java Detailing Workshop, which then the results of this fishbone diagram will be used to assist the Evaluation process in the process of making the MEPIS productivity cycle.

The process of making the **MEPIS productivity cycle** begins with measuring or calculating productivity (measurements), the measurement of productivity carried out is the measurement of work units related to the car detailing process at the Java Detailing Workshop in the period November 2020 to October 2021 which will be compared every month in that period, With this 12 month interval, according to the author, it has been able to meet the data needs in making the MEPIS productivity cycle.
Next is the productivity evaluation process by evaluating the productivity of several existing productivity, such as work productivity for the X month period with the previous month, targets set by the Java Detailing Workshop, and existing productivity planning.

The third process is productivity planning , in this process the author will make a productivity plan for the Java Detailing Workshop based on the results of measurements and evaluations that have been carried out previously, for the planning period it is divided into two, namely short-term productivity planning with intervals planning for less than one year and long-term productivity planning with an interval of more than one year.
The fourth process is the process of increasing productivity (improvement) by seeing what things can be improved from the previous plan.

The last process is the process of maintaining productivity (sustaining) which aims to be able to ensure that the productivity that has been increased will not decrease in the future, in this process the author will determine what factors can increase productivity and need to be maintained, monitor achievements at intervals of 12 months in the period November 2020 to October 2021, as well as providing some suggestions of actions that need to be taken if there is a decline in productivity.

4. Data Collection

The results of the observations that the author made directly on the object of observation of the Java Detailing Workshop, the Java Detailing Workshop in carrying out the car detailing process had 6 stages of activities where each activity has its own sub-activity, the following can be seen in Figure 3 related to the flowchart of the stages the car detailing process activities and Table 2 is related to the details of each activity stage in the car detailing process.

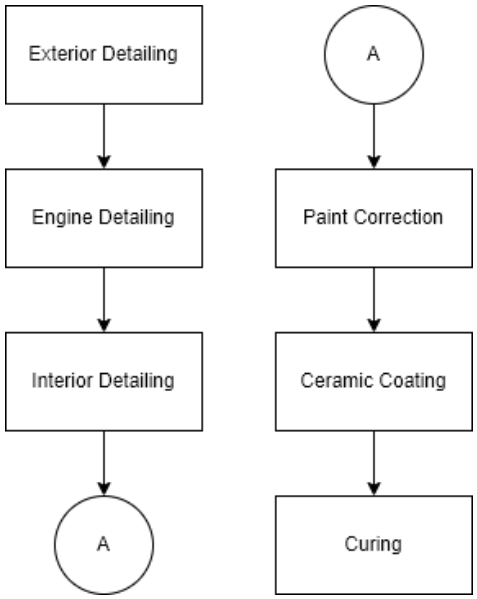

Figure 4. Flowchart of the stages of the car detailing process

Table 2. List of activity stages and sub-activities of the car detailing process on the observed object

Activity Stage	Sub-Activity
1. *Exterior Detailing*	1.1 Preparation of car wash soap with water
	1.2 Car wash with clean water
	1.3 Washing with soap on all parts of the body in detail
	1.4 Rinse the soap on the car body with clean water
	1.5 Applying the Clay Bar
	1.6 Car drying
	1.7 Washing undercarriage of the car with clean water
	1.8 Washing undercarriage of the car with soap in detail
	1.9 Rinse the soap on the car undercarriage with clean water
	1.10 Drying car undercarriage
2. *Engine Detailing*	2.1 Preparation of engine degreaser soap and liquid
	2.2 Closing parts of the engine air duct
	2.3 Washing the engine bay with clean water
	2.4 Engine bay washing with soap
	2.5 Flushing the engine bay with clean water
	2.6 Apply engine degreaser to the required parts
	2.7 Flushing the engine bay with clean water
	2.8 Drying engine bay
3. *Interior Detailing*	3.1 Masking car accessories (chrome list, plastic parts)
	3.2 Removing the car seat and console box (optional)

	3.3 Cleaning the car dashboard
	3.4 Cleaning the car door trim
	3.5 Cleaning the car seats and console box
	3.6 Cleaning the car base carpet
	3.7 Replacing the car seat and console box
	3.8 Unmasking
4. *Paint Correction*	4.1 Measuring paint thickness on each panel
	4.2 Masking car accessories (chrome list, plastic body)
	4.3 Polishing
	4.4 *Finishing*
	4.5 Unmasking
5. *Ceramic Coating*	5.1 Masking car accessories (chrome list, plastic body)
	5.2 Applying the first layer of Ceramic Coating on the car body
	5.3 Applying a second layer of Ceramic Coating on the car body (Medium Guard and Maximum Guard only)

Table 3. List of activity stages and sub-activities of the car detailing process on the observed object (Con't)

Activity Stage	Sub-Activity
5. *Ceramic Coating*	5.4 Unmasking
6. *Curing*	6.1 Drying the ceramic coating that has been applied to the car with an infrared lamp for 6 hours

Furthermore, for the car detailing process, the Java Detailing Workshop has 4 indoor working bays where each working bay can be loaded by one car and the working bay is divided based on the type of activity carried out in it which is divided into 2 parts (Table 3), namely non-sterile and non-sterile. sterile. Each working bay in the Java Detailing Workshop has its own workers, where all work is done sequentially based on the working bay. The following in Table 4 is a breakdown of the activities carried out in the working bay and the number of workers in each working bay in the Java Detailing Workshop.

Table 4. Details of activity stages and number of workers from each working bay in the car detailing process

Working Bay	Number of Workers	Activity Stage
Indoor 1	3 Workers	*Exterior Detailing*
		Engine Detailing
Indoor 2	3 Workers	*Interior Detailing*
		Paint Correction
Indoor Sterile 3	3 Workers	*Ceramic Coating*
Indoor Sterile 4	2 Workers	*Curing*

In addition to making observations, the author conducted a Focus Group Discussion (FGD) with the owner of the Java Detailing Workshop which aims to obtain the necessary information related to the existing condition of the object observed in the Java Detailing Workshop as well as the views of the owner who has been engaged in the car detailing sector since 2015. 2010 regarding the good and correct and efficient car detailing process.

First, related to the internals of the Java Detailing Workshop itself, it has normal operating hours from 9.00 WIB to 18.00 WIB where there will usually be an overtime session until 21.00 WIB to continue the car detailing work so that it can be completed quickly but for overtime itself there is no schedule. definite or definite schedule, which is for the working hours of the car detailing process at the Java Detailing Workshop for 12 hours per day. Furthermore, for the number of workers who handle this car detailing service, there are 12 people who are responsible for their respective working bays and for the work to be carried out sequentially from working bay 1 to working bay 2 and so on.

Furthermore, for the monthly wages of workers who handle car detailing services, the City Minimum Wage for the Detailing Workshop area of West Java is Rp. 4,791,843 which is then added with a bonus of Rp. 200,000 per car carried out by each worker and Rp. 25,000 for meals. daily and Rp. 25,000 for daily transportation fees. Regarding the capital or input value for each car detailing package offered by the Java Detailing Workshop, it is not stated numerically, but the Java Detailing Workshop owner said that the profit margin for each car detailing package is 40% of the total capital or input. Then related to the car detailing process which is at the Java Detailing Workshop itself, according to the owner for this car detailing business, the main target is the quality of the work carried out, from the car detailing procedures carried out by the Java Detailing Workshop, it has been designed according to the standard it should be but there is still the possibility to speed up the car detailing process while maintaining the proper quality of work, and activities that may not be accelerated according to the expert are exterior detailing activities for the legs, ceramic coating, and curing. Barriers that make the Java Detailing Workshop unable to make improvements in productivity or speed up services are due to the continuous demand coming in without a break so that the company's focus is on maintaining service quality.

Measurement

At the time of data collection, the authors observed and took time samples from each activity in the car detailing process at the Java Detailing Workshop to be able to find out the length of each activity and sub-activity so that it would facilitate the analysis process and have accurate numerical data. valid. However, because one car detailing process can take up to 2 days or more and the limited time of this research, the authors can only take 4 samples of the time of the car detailing process, which can be seen in Table 5 below.

Table 5. Sample Time for Each Activity in the Car Detailing Process

Activity	Sample 1 (Second)	Sampel 2 (Second)	Sampel 3 (Second)	Sampel 4 (Second)	Average (Second)	Average (Hour)
1. *Exterior Detailing*	**15196**	**15061**	**15484**	**16385**	**15531,5**	**4,31**
1.1 Preparation of car wash soap with water	102	106	98	113	104,75	0,03
1.2 Car wash with clean water	571	568	562	582	570,75	0,16
1.3 Washing with soap on all parts of the body in detail	4398	4256	4485	4572	4427,75	1,23
1.4 Rinse the soap on the car body with clean water	492	501	486	525	501	0,14
1.5 Applying the Clay Bar	4462	4590	4681	4852	4646,25	1,29
1.6 Car drying	382	379	362	465	397	0,11
1.7 Washing undercarriage of the car with clean water	518	522	502	594	534	0,15

1.8 Washing undercarriage of the car with soap in detail	3412	3255	3465	3645	3444,25	0,96
1.9 Rinse the soap on the car undercarriage with clean water	462	472	452	562	487	0,14
1.10 Drying car undercarriage	397	412	391	475	418,75	0,12
2. *Engine Detailing*	**8912**	**9551**	**8907**	**10446**	**9454**	**2,63**
2.1 Preparation of engine degreaser soap and liquid	126	128	121	128	125,75	0,03
2.2 Closing parts of the engine air duct	156	169	148	185	164,5	0,05
2.3 Washing the engine bay with clean water	362	290	261	412	331,25	0,09
2.4 Engine bay washing with soap	2160	2265	2102	2419	2236,5	0,62
2.5 Flushing the engine bay with clean water	282	301	290	384	314,25	0,09
2.6 Apply engine degreaser to the required parts	4951	5658	5310	5942	5465,25	1,52
2.7 Flushing the engine bay with clean water	384	312	283	434	353,25	0,10
2.8 Drying engine bay	491	428	392	542	463,25	0,13

Table 6. Sample Time for Each Activity in the Car Detailing Process (Con't)

Activity	Sample 1 (Second)	Sampel 2 (Second)	Sampel 3 (Second)	Sampel 4 (Second)	Average (Second)	Average (Hour)
3. *Interior Detailing*	**15196**	**15061**	**15484**	**16385**	**15531,5**	**4,31**
3.1 Masking car accessories (chrome list, plastic parts)	1958	1810	2051	2092	1977,75	0,55
3.2 Removing the car seat and console box (optional)	3698	3502	3785	3710	3673,75	1,02
3.3 Cleaning the car dashboard	2385	2110	2486	2580	2390,25	0,66
3.4 Cleaning the car door trim	2954	2803	3054	3170	2995,25	0,83
3.5 Cleaning the car seats and console box	3119	2957	3284	3212	3143	0,87
3.6 Cleaning the car base carpet	2425	2510	2499	2398	2458	0,68
3.7 Replacing the car seat and console box	3584	3624	3698	3650	3639	1,01
3.8 Unmasking	677	584	693	715	667,25	0,19
4. *Paint Correction*	**12303**	**12964**	**12439**	**12952**	**12664,5**	**3,52**
4.1 Measuring paint thickness on each panel	1108	1003	1152	1201	1116	0,31

4.2 Masking car accessories (chrome list, plastic body)	2574	2751	2640	2811	2694	0,75
4.3 Polishing	7125	7458	7108	7310	7250,25	2,01
4.4 *Finishing*	625	698	640	695	664,5	0,18
4.5 Unmasking	871	1054	899	935	939,75	0,26
5. *Ceramic Coating*	**10814**	**11326**	**11122**	**11379**	**11160,3**	**3,10**
5.1 Masking car accessories (chrome list, plastic body)	2584	2675	2597	2762	2654,5	0,74
5.2 Applying the first layer of Ceramic Coating on the car body	3745	3912	3845	3997	3874,75	1,08
5.3 Applying a second layer of Ceramic Coating on the car body (Medium Guard and Maximum Guard only)	3610	3784	3820	3810	3756	1,04
5.4 Unmasking	875	955	860	810	875	0,24
6. *Curing*	**21600**	**21600**	**21600**	**21600**	**21600**	**6,00**
6.1 Drying the ceramic coating that has been applied to the car with an infrared lamp for 6 hours	21600	21600	21600	21600	21600	6,00
Total	**89625**	**90402**	**91102**	**94289**	**91354,5**	**25,38**

From the data in Table 5 to Table 6, it is obtained that the average total time for the completion of the car detailing process from the four samples is 25.38 hours or 25 hours 22 minutes with details on the exterior detailing stage for 4 hours 18 minutes, engine detailing for 2 hours 38 minutes, interior detailing for 5 hours 49 minutes, paint correction for 3 hours 31 minutes, ceramic coating for 3 hours 6 minutes, and curing for 6 hours.

Regarding the company's priority scale, the results I got from the FGD which are the main priority are related to working hours or worker productivity in carrying out the car detailing process at the Java Detailing Workshop and how the company can increase its monthly service capacity with existing land and reduce queues. for the car detailing process, then the second priority is related to how to adjust working hours to the existing demand, and the last is related to the use of energy in doing car detailing.

To help analyze productivity in the car detailing process at the Java Detailing Workshop, input and output data is needed to help with calculations where the results of these calculations can assist in doing productivity analysis, the following in Table 7 is a monthly service and financial report from car detailing services which is at the Java Detailing Workshop which is equipped with details of what car detailing packages are carried out every month in the period November 2020 to October 2021.

Table 7. Monthly Service and Financial Report for Car Detailing Services for the period November 2020 to April 2021

Monthly Service & Financial Report for Car Detailing Services at the Java Detailing Workshop						
	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21
Package						
Basic Guard	11	13	12	10	11	9
Medium Guard	10	7	9	8	8	11

Maximum Guard	6	6	7	12	10	9
Serviced Cars	27	26	28	30	29	29
Car Not Serviced	21	28	23	21	20	23
Total Demand	48	54	51	51	49	52
Working days	25	25	24	23	26	25
Basic Wage	Rp 53.960.273	Rp 53.960.273	Rp 53.910.273	Rp 53.860.273	Rp 54.010.273	Rp 53.960.273
Bonus Wage	Rp 5.400.000	Rp 5.200.000	Rp 5.600.000	Rp 6.000.000	Rp 5.800.000	Rp 5.800.000
Electricity	Rp 5.019.045	Rp 5.019.046	Rp 5.019.047	Rp 5.019.048	Rp 5.019.049	Rp 5.019.050
Raw material	Rp 47.701.053	Rp 41.438.733	Rp 52.038.016	Rp 68.717.834	Rp 60.878.549	Rp 61.828.367
Total *input*	Rp 112.080.371	Rp 100.418.052	Rp 110.967.336	Rp 127.597.155	Rp 119.907.871	Rp 120.807.690
Output	Rp 149.250.000	Rp 140.500.000	Rp 155.250.000	Rp 178.500.000	Rp 167.750.000	Rp 169.000.000
Profit	Rp 37.169.630	Rp 40.081.949	Rp 44.282.664	Rp 50.902.845	Rp 47.842.130	Rp 48.192.311

Table 8. Monthly Service and Financial Report for Car Detailing Services for the period November 2020 to April 2021 (Con't)

Monthly Service & Financial Report for Car Detailing Services at the Java Detailing Workshop						
	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21
Package						
Basic Guard	10	11	9	11	12	12
Medium Guard	10	9	10	10	7	8
Maximum Guard	9	7	8	8	9	8
Serviced Cars	29	27	27	29	28	28
Car Not Serviced	20	20	21	20	21	22
Total Demand	49	47	48	49	49	50
Working days	23	25	26	24	26	25
Basic Wage	Rp 53.860.273	Rp 53.960.273	Rp 54.010.273	Rp 53.910.273	Rp 54.010.273	Rp 53.960.273
Bonus Wage	Rp 5.800.000	Rp 5.400.000	Rp 5.400.000	Rp 5.800.000	Rp 5.600.000	Rp 5.600.000
Electricity	Rp 5.019.051	Rp 5.019.052	Rp 5.019.053	Rp 5.019.054	Rp 5.019.055	Rp 5.019.056
Raw material	Rp 60.852.831	Rp 48.952.296	Rp 52.304.614	Rp 58.476.044	Rp 54.440.508	Rp 53.239.257

Total *input*	Rp 119.732.155	Rp 107.931.621	Rp 111.333.940	Rp 117.405.371	Rp 113.469.836	Rp 112.218.586
Output	Rp 167.500.000	Rp 151.000.000	Rp 155.750.000	Rp 164.250.000	Rp 158.750.000	Rp 157.000.000
Profit	Rp 47.767.845	Rp 43.068.380	Rp 44.416.061	Rp 46.844.630	Rp 45.280.164	Rp 44.781.414

From the data listed in Table 7 to Table 8, the basic wage obtained from food and transportation allowances for workers is Rp. 50,000 which was multiplied by the number of working days in that month, then added up with the Java Detailing Workshop area UMK of Rp.4,791,843, then the result of the sum was multiplied by the number of workers at the Java Detailing Workshop as many as 11 workers. For bonus wages obtained from Rp. 200,000 multiplied by the number of cars or customers served in that month.

5. Results and Discussion

5.1 Numerical Results

Evaluation

The OMAX manufacturing process begins with making productivity criteria which will be a measure of the productivity of the car detailing process at the Java Detailing Workshop. Based on the existing car detailing process, the following is the equation of the productivity ratio criteria for the car detailing process.

$$\text{Ratio 1} = \frac{Served\ Cars}{Demand}$$

$$\text{Ratio 2} = \frac{Served\ Cars}{Unserved\ Cars}$$

$$\text{Ratio 3} = \frac{Served\ Cars}{Electricity\ Bill}$$

$$\text{Ratio 4} = \frac{Served\ Cars}{Working\ Hours}$$

$$\text{Ratio 5} = \frac{Demand}{Working\ Hours}$$

After determining the ratio that will be used in making OMAX, the next step is to calculate each ratio according to the period to be calculated, as follows in Table 9 the details of the data from the calculation results of each ratio in the period November 2020 to October 2021.

Table 9. OMAX ratio calculation result data

	Ratio 1	Ratio 2	Ratio 3	Ratio 4	Ratio 5
Nov-20	0,56250	1,28571	185890,6	0,09000	0,16000
Dec-20	0,48148	0,92857	193040,2	11,53846	0,18000
Jan-21	0,54902	1,21739	179251,7	10,28571	0,17708
Feb-21	0,58824	1,42857	167301,6	9,20000	0,18478
Mar-21	0,59184	1,38095	173070,7	10,75862	0,15705
Apr-21	0,55769	1,26087	173070,7	10,34483	0,17333
May-21	0,59184	1,45000	173070,7	9,51724	0,17754
Jun-21	0,57447	1,35000	185890,8	11,11111	0,15667

Jul-21	0,56250	1,28571	185890,9	11,55556	0,15385
Aug-21	0,59184	1,45000	173070,8	9,93103	0,17014
Sep-21	0,57143	1,33333	179252,0	11,14286	0,15705
Oct-21	0,56000	1,27273	179252,0	10,71429	0,16667
Total	6,78284	15,64385	2148052,6	116,18971	2,01416
Average	0,56524	1,30365	179004,4	9,68248	0,16785
Max	0,59184	1,45000	193040,2	11,55556	0,18478
Min	0,48148	0,92857	167301,6	0,09000	0,15385

Next is to determine the performance indicators by looking at the performance ratio in a certain period of the ratio interpolation value contained on the performance scale. In making the performance scale, it begins by looking at the calculation data in Table 9, the min value will be placed on a scale of 0, the average value will be placed on a scale of 3, and the max value will be placed on a scale of 10, then the three filled scales will be interpolated. with the following formula.

$$\text{Interpolation of level 1 and 2 increments} = \frac{Level\ 3 - Level\ (X-1)}{3-(X-1)}$$

$$\text{Interpolation of level 4 until 9 increments} = \frac{Level\ 10 - Level\ (X-1)}{10-(X-1)}$$

X = Is the umpteenth level that is calculated

From the interpolation calculation using the formulas on the five existing ratios, the results of the interpolation calculation are seen on what scale is closest to the ratio value each month that has been obtained in Table 7 to Table 8, then the scale value is multiplied by the weight which is the company's previous priority scale. obtained from the results of the FGD in which then the results of the multiplication of each ratio are added up. The following in Table 10 to Table 22 is a table of performance indicators each month based on the results of the ratio calculations that have been carried out.

Table 10. Performance Indicator Calculation Results for November 2020

	November 2020					
Criteria	Ratio 1	Ratio 2	Ratio 3	Ratio 4	Ratio 5	
Performance	0,56250	1,28571	185890,6	0,09000	0,16000	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	3	3	9	0	2	
Weight (%)	20	25	10	25	20	
Value	60	75	90	0	40	
				Performance Indicator	265	

Table 11 Performance Indicator Calculation Results for December 2020

	December 2020					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,48148	0,92857	193040,2	11,53846	0,18000	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	0	0	10	10	9	
Weight (%)	20	25	10	25	20	
Value	0	0	100	250	180	
				Performance Indicator	530	

Table 12. Performance Indicator Calculation Results for January 2021

	January 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,54902	1,21739	179251,7	10,28571	0,17708	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	3	3	3	8	9	
Weight (%)	20	25	10	25	20	
Value	60	75	30	200	180	
				Performance Indicator	545	

Table 13. Performance Indicator Calculation Results for February 2021

	February 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,58824	1,42857	167301,6	9,20000	0,18478	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6

	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	10	10	0	3	10	
Weight (%)	20	25	10	25	20	
Value	200	250	0	75	200	
				Performance Indicator	725	

Table 14. Performance Indicator Calculation Results for March 2021

	March 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,59184	1,38095	173070,7	10,75862	0,15705	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	10	9	2	9	1	
Weight (%)	20	25	10	25	20	
Value	200	225	20	225	20	
				Performance Indicator	690	

Table 15. Performance Indicator Calculation Results for April

	April 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,55769	1,26087	173070,7	10,34483	0,17333	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4

Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	3	3	2	8	8	
Weight (%)	20	25	10	25	20	
Value	60	75	20	200	160	
				Performance Indicator	515	

Table 16. Performance Indicator Calculation Results for May 2021

	May 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,59184	1,45000	173070,7	9,51724	0,17754	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	10	10	2	4	9	
Weight (%)	20	25	10	25	20	
Value	200	250	20	100	180	
				Performance Indicator	750	

Table 17. Performance Indicator Calculation Results for June 2021

	June 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,57447	1,35000	185890,8	11,11111	0,15667	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5

	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	8	8	9	10	1	
Weight (%)	20	25	10	25	20	
Value	160	200	90	250	20	
				Performance Indicator	720	

Table 18. Performance Indicator Calculation Results for July 2021

	July 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,56250	1,28571	185890,9	11,55556	0,15385	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	3	3	9	10	0	
Weight (%)	20	25	10	25	20	
Value	60	75	90	250	0	
				Performance Indicator	475	

Table 19. Performance Indicator Calculation Results for August 2021

	August 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,59184	1,45000	173070,8	9,93103	0,17014	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5

	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	10	10	2	4	4	
Weight (%)	20	25	10	25	20	
Value	200	250	20	100	80	
				Performance Indicator	650	

Table 20. Performance Indicator Calculation Results for September 2021

	September 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,57143	1,33333	179252,0	11,14286	0,15705	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4
Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	7	6	3	9	1	
Weight (%)	20	25	10	25	20	
Value	140	150	30	225	20	
				Performance Indicator	565	

Table 21. Performance Indicator Calculation Results for October 2021

	October 2021					
Criteria	Rasio 1	Rasio 2	Rasio 3	Rasio 4	Rasio 5	
Performance	0,56000	1,27273	179252,0	10,71429	0,16667	
Target	0,59184	1,45000	193040,2	11,55556	0,18478	10
	0,57854	1,37683	186022,3	10,61902	0,17631	9
	0,57410	1,35244	183683,0	10,30684	0,17349	8
	0,57189	1,34024	182513,3	10,15075	0,17208	7
	0,57056	1,33292	181811,6	10,05709	0,17123	6
	0,56967	1,32804	181343,7	9,99466	0,17067	5
	0,56904	1,32456	181009,5	9,95006	0,17027	4

Standart Performance	0,56524	1,30365	179004,4	9,68248	0,16785	3
	0,52336	1,11611	173153,0	4,88624	0,16085	2
	0,50940	1,05360	171202,5	3,28749	0,15851	1
	0,48148	0,92857	167301,6	0,09000	0,15385	0
Score	3	3	3	9	3	
Weight (%)	20	25	10	25	20	
Value	60	75	30	225	60	
				Performance Indicator	450	

The OMAX analysis is done by looking at the achievement of the score of each ratio which aims to see the score of each productivity ratio in the previous productivity calculation. The following in Table 22 is the score data for each ratio in the period November 2020 to October 2021.

Table 22. Productivity Ratio

Month	Ratio 1	Ratio 2	Ratio 3	Ratio 4	Ratio 5
November 2020	3	3	9	0	2
December 2020	0	0	10	10	9
January 2021	3	3	3	8	9
February 2021	10	10	0	3	10
March 2021	10	9	2	9	1
April 2021	3	3	2	8	8
May 2021	10	10	2	4	9
June 2021	8	8	9	10	1
July 2021	3	3	9	10	0
August 2021	10	10	2	4	4
September 2021	7	6	3	9	1
October 2021	3	3	3	9	3
Total	70	68	54	84	57

It can be seen in Table 22 related to the causes of a decrease in productivity in the car detailing process, it can be seen from the smallest total score in the period November 2020 to October 2021, namely the ratio 3 which relates to the optimization of energy use which is the result of a comparison of the cars served with the amount of energy costs used. Meanwhile, related to the smallest cause of a decrease in productivity is a ratio of 5 which is related to optimizing the duration of car detailing services which is a comparison of the car served with working hours.

5.2 Graphical Results

From the results of the calculation of performance indicators in Table 10 to Table 21, the following in Figure 5 is a summary of the performance indicators for the period November 2020 to October 2021 in a line graph.

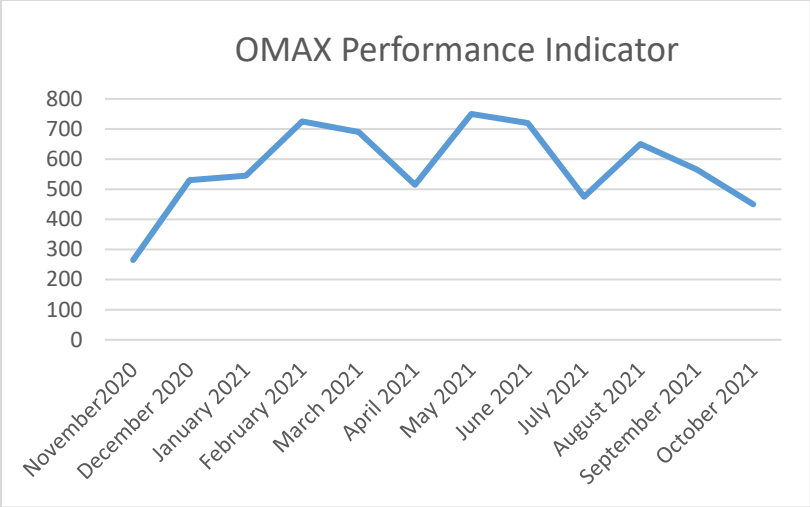

Figure 5. Performance Indicator Graph

From observations and interviews with the owner that the author did directly at the Java Detailing Workshop that there have been no tools that have been used by the object of observation in evaluating productivity, to facilitate productivity evaluation it is necessary to identify existing problems and therefore make a fishbone diagram that shows cause and effect in planning future improvements. The following in Figures 6 to 7 are fishbone diagrams related to optimizing energy use.

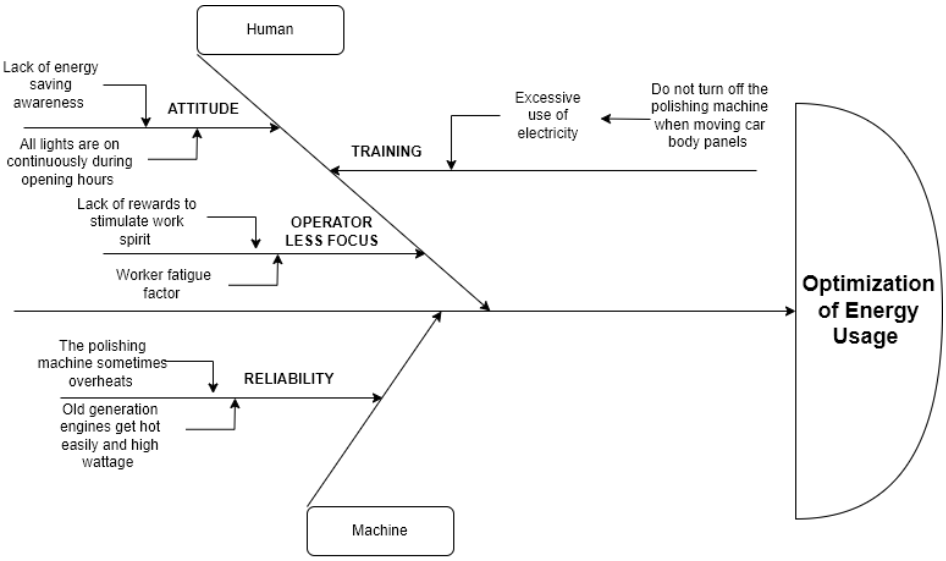

Figure 6. Fishbone Diagram of Optimization of Energy Usage

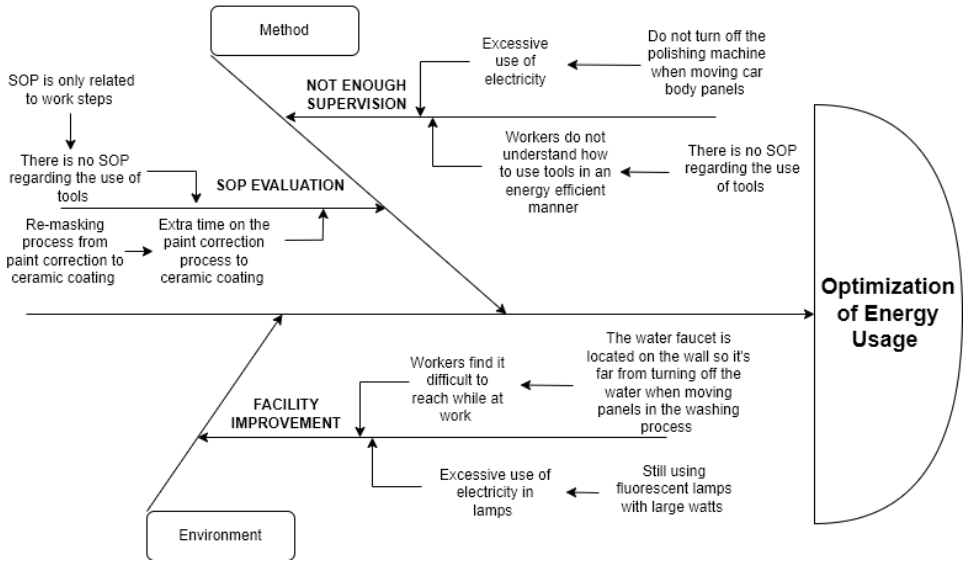

Figure 7. Fishbone Diagram of Optimization of Energy Usage (Con't)

5.3 Proposed Improvements

Planning

From the fishbone diagram in Figures 6 to 7, it can be seen that the problem factors that cause the non-optimal use of energy in the car detailing process are humans, machines, methods, and the environment. By looking at these factors, it is necessary to make improvements to these factors to be able to solve problems related to the non-optimal use of energy. The following in Table 23 to Table 24 are proposed improvement plans that can be carried out by the Java Detailing Workshop in the car detailing process both in the short to long term.

Table 23. Long Term Planning

Long Term Planning		
Factor	Action	Plan
Human	Preparation of change agents	Looking for employees who are willing to advance and make them role models
		Understanding employee characteristics
		Doing brainstorming related to energy-saving culture
Machine	Machine Upgrade	Replacing a machine that has frequent problems and cannot be repaired
Method	Target Setting	Setting performance targets
		Incentive planning
	SOP Evaluation	Revise SOP and company culture towards energy saving culture

		Streamline SOP work processes on car detailing by concurrently or eliminating activities that are less efficient
Environment	Facility Improvement	Replacing the water nozzle with a lever to open the lid at the end of the hose so that workers can easily reach the water opening and closing mechanism
		Replacing fluorescent lamps with LED lamps to be more energy efficient

Table 24. Short Term Planning

Short Term Planning		
Factor	Action	Plan
Human	Worker Evaluation	Conduct evaluations related to the performance of each worker
	Worker Training	Provide directions related to procedures for using tools to save energy
		Cultivate energy saving awareness
	Employee Control	Provide direct direction when something goes wrong
Machine	Machine Maintenance	Perform machine maintenance whenever possible

Improvement

In increasing productivity, not only evaluating and planning, but there is a need for improvement in order to increase existing productivity, especially in the car detailing process at the Java Detailing Workshop. From the evaluation results using fishbone diagrams and long-term and short-term planning, productivity improvement is carried out by providing improvements to existing processes from various factors or areas that can be improved. The results of the fishbone diagram include four factors, namely humans, machines, methods, and the environment, the following are improvements that can be made to the car detailing process which are divided based on the results of the fishbone diagram.

In the human factor, the problems found in the fishbone diagram are related to worker awareness regarding energy savings, in addition to conducting training for employees, the company also needs to give appreciation to workers when they can apply an energy-saving culture which can trigger employees to be more concerned with saving. energy so that the optimization of energy use can run well. Due to the existing conditions, the Java Detailing Workshop has an appreciation scheme of Rp. 200,000 per car that can be served, there will be a change in the appreciation scheme added with an appreciation of energy use as seen from the partial energy productivity index in the car detailing process which can be seen in Table 25.

Table 25. Employee Salary Scheme Improvement

Employe Salary Scheme			
Basic Salary	Meal + Transport (per day)	Bonus per car served	Bonus if the energy productivity index is above 32
Rp 4.791.843	Rp 50.000	Rp 200.000	4 % from Total Salary

With the addition of bonuses related to energy productivity, it can trigger the enthusiasm and ambition of the workers to be able to optimize energy use in the car detailing process at the Java Detailing Workshop when viewed from the Productivity Benefit Model.

On the machine factor, the problem is that the polishing machine is getting old and sometimes has overheating problems which make the use of electricity in paint correction activities consume a lot of electricity from where it should be, therefore the improvement made is to replace the polishing machine with the latest generation which is more efficient energy and does not heat up quickly which in the existing conditions the polishing machine used at the Java Detailing Workshop uses 1250 watts of power and for the new generation machine with the same rotary power it has a lower power consumption of 1000 watts, so in addition to reducing electricity usage can also directly reduce processing time so that it can increase the monthly service capacity in the car detailing process at the Java Detailing Workshop which can be seen in Table 27 to 28.

In the method factor, the problem that exists is the lack of supervision or supervision of workers who do not turn off the polishing machine while moving panels in the polishing process which will make the polishing machine continue to run during the transfer and waste energy used and can make the polishing machine to overheat faster. In addition, the absence of procedures for using energy-efficient work tools in the SOP for the car detailing process is also one of the reasons why there is wasteful use of energy and the existence of work that can actually be combined or eliminated because the work is a work that accumulates and does not give the effect of working properly. better but takes longer, therefore it is necessary to evaluate the existing SOP. The following in Table 26 is an example of making SOPs related to procedures for using work tools in an energy efficient manner.

Table 26. Tool Usage SOP

Tool Usage SOP	
Washing	Turn on the faucet only when needed
	Turning off the water faucet when idle (When changing positions or panels)
Polishing	Before using the machine, please ensure that the pad used is clean from previous work
	Turn on the polisher only when needed
	Turning off the polisher at idle (when changing positions or panels)
	When finished using the polishing tool, please clean or replace the pad if the condition is bad

Next in Table 29 the time of washing activities can be reduced by using the top to down washing method where washing is carried out sequentially from top to bottom so that the washing process can be more efficient with the same washing quality as the previous process which runs in reverse from bottom to top then down again, With these changes, it can speed up the washing stage, which previously had an average of 4 hours 18 minutes to 4 hours 10 minutes. Furthermore, in Table 30 it can be seen that there are two activities that were omitted, namely the activity of opening the mask at the paint correction stage and the activity of performing masking at the ceramic coating stage, this was done because the masking previously used at the paint correction stage could still function properly for the ceramic coating stage. so that it can make the processing time at the paint correction stage which previously had an average time of 3 hours 31 minutes to 3 hours 15 minutes and at the ceramic coating stage which previously had an average time of 3 hours 6 minutes to 2 hours 21 minutes, other than that improvement This will also save on the masking tape used. So from the overall improvement, it can make the car detailing process time which previously had an average time of 25 hours 22 minutes to 24 hours 12 minutes which means it can shorten the total time of the car detailing process by 1 hour 10 minutes which from the data there is an increase of 6 % than before and can directly increase production capacity and reduce the use of energy ratios, especially lights which are always on during workshop operating hours and are not tied to the number of cars served.

In environmental factors, the existing problem is improving work facilities, especially in the washing process where to open and close the water flow there is only a faucet located far from the work site and attached to the wall so that the faucet is difficult to reach when workers are changing positions or panels. which is being washed and causes the water to continue to flow which directly causes the pump to continue to pump and use excess electricity, then also to the use of lamps in the workshop which still use fluorescent lamps which use greater electrical energy compared to

the newest types of lamps, namely LED lamps which According to Nurdiana (2018), fluorescent lamps with a power of 36 watts with two lamps can produce 2500 lumens while LED type lamps with a power of 40 watts only have one light. The lamp can produce 3600 lumens. Therefore, it is necessary to improve both aspects by providing a nozzle with an opening lever and closing the flow of water that is affordable by the workers so that when they are idle the use of water can be stopped directly and when they want to use water again, the worker can immediately open the water flow again. which makes the use of water and electricity more efficient and speeds up the washing process. Furthermore, related to lamps, it is possible to replace the lamp units that previously used the neon type into LED lamps which have the same brightness level but with lower electricity consumption.

Sustaining

The last stage of the mepis productivity cycle is sustaining or maintaining productivity which ensures that there will not be a decrease in productivity in the future which in the car detailing process at the Java Detailing Workshop requires regular supervision of worker performance, so that if there is a decrease in performance it can be immediately mitigated so that there is no significant reduction. In addition, using the incentive bonus scheme as listed in Table 26 can trigger workers to be able to provide the best performance to the company which of course the performance of the workers will be evaluated at the end of each month.

5.4 Validation

The following in Table 27and 28 is a calculation of electricity use before and after the improvement based on the electricity rates for the business class B-2/TR 6,600 VA to 200 kVA of Rp. 1,444.70/kWh.

Table 27. Table Comparison of Electricity Costs for Polishing Machines 1250W with 1000W

	Work Days	Number of Polishing Machines	Polishing Machine Electric Consumption 1250W	Polishing Machine Electric Consumption 1000W	Percentage Improvement
Nov-20	25	6	Rp 3.250.575	Rp 2.600.460	25%
Dec-20	25	6	Rp 3.250.575	Rp 2.600.460	25%
Jan-21	24	6	Rp 3.120.552	Rp 2.496.442	25%
Feb-21	23	6	Rp 2.990.529	Rp 2.392.423	25%
Mar-21	26	6	Rp 3.380.598	Rp 2.704.478	25%
Apr-21	25	6	Rp 3.250.575	Rp 2.600.460	25%
May-21	23	6	Rp 2.990.529	Rp 2.392.423	25%
Jun-21	25	6	Rp 3.250.575	Rp 2.600.460	25%
Jul-21	26	6	Rp 3.380.598	Rp 2.704.478	25%
Aug-21	24	6	Rp 3.120.552	Rp 2.496.442	25%
Sep-21	26	6	Rp 3.380.598	Rp 2.704.478	25%

Table 28. Table Comparison of Electricity Costs for Polishing Machines 1250W with 1000W (Con't)

	Work Days	Number of Polishing Machines	Polishing Machine Electric Consumption 1250W	Polishing Machine Electric Consumption 1000W	Percentage Improvement
Oct-21	25	6	Rp 3.250.575	Rp 2.600.460	25%
Average			**Rp 3.218.069**	**Rp 2.574.455**	**25%**

Furthermore, the following in Table 29 to Table 31 is a simulation of the total time that can be carried out from evaluating work that accumulates by making efficiency or eliminating work which can speed up processing time.

Table 29. Simulation Improvement of Total Work Time

Activity	**Sample 1 (Second)**	**Sampel 2 (Second)**	**Sampel 3 (Second)**	**Sampel 4 (Second)**	**Average (Second)**	**Average (Hour)**

1. *Exterior Detailing*	14720	14590	14958	15736	15001	4,17
1.1 Preparation of car wash soap with water	102	106	98	113	104,75	0,03
1.2 Car wash with clean water	461	466	467	472	466,5	0,13
1.3 Washing with soap on all parts of the body in detail	4095	3951	4110	4195	4087,75	1,14
1.4 Rinse the soap on the car body with clean water	492	501	486	525	501	0,14
1.5 Applying the Clay Bar	4462	4590	4681	4852	4646,25	1,29
1.6 Car drying	382	379	362	465	397	0,11
1.7 Washing undercarriage of the car with clean water	518	522	502	594	534	0,15
1.8 Washing undercarriage of the car with soap in detail	3412	3255	3465	3645	3444,25	0,96
1.9 Rinse the soap on the car undercarriage with clean water	435	441	423	431	432,5	0,12
1.10 Drying car undercarriage	397	412	391	475	418,75	0,12
2. *Engine Detailing*	**8912**	**9551**	**8907**	**10446**	**9454**	**2,63**
2.1 Preparation of engine degreaser soap and liquid	126	128	121	128	125,75	0,03
2.2 Closing parts of the engine air duct	156	169	148	185	164,5	0,05
2.3 Washing the engine bay with clean water	362	290	261	412	331,25	0,09
2.4 Engine bay washing with soap	2160	2265	2102	2419	2236,5	0,62
2.5 Flushing the engine bay with clean water	282	301	290	384	314,25	0,09

Table 30. Simulation Improvement of Total Work Time (Con't)

Activity	Sample 1 (Second)	Sampel 2 (Second)	Sampel 3 (Second)	Sampel 4 (Second)	Average (Second)	Average (Hour)
2.6 Apply engine degreaser to the required parts	4951	5658	5310	5942	5465,25	1,52
2.7 Flushing the engine bay with clean water	384	312	283	434	353,25	0,10
2.8 Drying engine bay	491	428	392	542	463,25	0,13
3. *Interior Detailing*	**15196**	**15061**	**15484**	**16385**	**15531,5**	**4,31**
3.1 Masking car accessories (chrome list, plastic parts)	1958	1810	2051	2092	1977,75	0,55

3.2 Removing the car seat and console box (optional)	3698	3502	3785	3710	3673,75	1,02
3.3 Cleaning the car dashboard	2385	2110	2486	2580	2390,25	0,66
3.4 Cleaning the car door trim	2954	2803	3054	3170	2995,25	0,83
3.5 Cleaning the car seats and console box	3119	2957	3284	3212	3143	0,87
3.6 Cleaning the car base carpet	2425	2510	2499	2398	2458	0,68
3.7 Replacing the car seat and console box	3584	3624	3698	3650	3639	1,01
3.8 Unmasking	677	584	693	715	667,25	0,19
4. *Paint Correction*	**12303**	**12964**	**12439**	**12952**	**12664,5**	**3,52**
4.1 Measuring paint thickness on each panel	1108	1003	1152	1201	1116	0,31
4.2 Masking car accessories (chrome list, plastic body)	2574	2751	2640	2811	2694	0,75
4.3 Polishing	7125	7458	7108	7310	7250,25	2,01
4.4 Finishing	625	698	640	695	664,5	0,18
4.5 Unmasking	0	0	0	0	0	0
5. *Ceramic Coating*	**10814**	**11326**	**11122**	**11379**	**11160,3**	**3,10**
5.1 Masking car accessories (chrome list, plastic body)	0	0	0	0	0	0
5.2 Applying the first layer of Ceramic Coating on the car body	3745	3912	3845	3997	3874,75	1,08
5.3 Applying a second layer of Ceramic Coating on the car body (Medium Guard and Maximum Guard only)	3610	3784	3820	3810	3756	1,04
5.4 Unmasking	875	955	860	810	875	0,24

Table 31 Simulation Improvement of Total Work Time (Con't)

Activity	Sample 1 (Second)	Sampel 2 (Second)	Sampel 3 (Second)	Sampel 4 (Second)	Average (Second)	Average (Hour)
6. *Curing*	**21600**	**21600**	**21600**	**21600**	**21600**	**6,00**
6.1 Drying the ceramic coating that has been applied to the car with an infrared lamp for 6 hours	21600	21600	21600	21600	21600	6,00
Total Before Improvement	**89625**	**90402**	**91102**	**94289**	**91354,5**	**25,38**
Total After Improvement	**89625**	**90402**	**91102**	**94289**	**91354,5**	**25,38**

The following in Table 32 is a table for calculating electricity usage before and after the improvement of the work per car based on the electricity tariff for the business class B-2/TR 6,600 VA to 200 kVA of Rp. 1,444.70/kWh.

Table 32 Comparison of 72W Fluorescent Lights with 40W LEDs

	Number of Work Days	Number of Lamps	Fluorescent Lamp Electric Consumption 72W	LED Lamp Electric Consumption 40W	Percentage Improvement
Nov-20	25	32	Rp 998.577	Rp 554.765	80%
Dec-20	25	32	Rp 998.577	Rp 554.765	80%
Jan-21	24	32	Rp 958.634	Rp 532.574	80%
Feb-21	23	32	Rp 918.691	Rp 510.384	80%
Mar-21	26	32	Rp 1.038.520	Rp 576.955	80%
Apr-21	25	32	Rp 998.577	Rp 554.765	80%
May-21	23	32	Rp 918.691	Rp 510.384	80%
Jun-21	25	32	Rp 998.577	Rp 554.765	80%
Jul-21	26	32	Rp 1.038.520	Rp 576.955	80%
Aug-21	24	32	Rp 958.634	Rp 532.574	80%
Sep-21	26	32	Rp 1.038.520	Rp 576.955	80%
Oct-21	25	32	Rp 998.577	Rp 554.765	80%
Average			**Rp 988.591**	**Rp 549.217**	**80%**

And the following in Table 33 to 34 is a total recap related to the comparison of total electricity consumption before and after the improvement, as well as related to the average amount of electricity usage for each car served and the percentage increase from the existing condition.

Table 33. Table Comparison of Total Electricity Costs and Average Electricity Per Existing Car With Improvements

	Work Days	Served Cars	Existring Total Electric Consumption	*Improvement* Total Electric Consumption	Average Existing Electricity Consumption Per Car	Average Electricity Consumption Improvement Per Car	Percentage Improvement
Nov-20	25	27	Rp 5.019.045	Rp 3.925.118	Rp 185.891	Rp 145.375	28%
Dec-20	25	26	Rp 5.019.046	Rp 3.925.119	Rp 193.040	Rp 150.966	28%
Jan-21	24	28	Rp 5.019.047	Rp 3.968.877	Rp 179.252	Rp 141.746	28%
Feb-21	23	30	Rp 5.019.048	Rp 4.012.635	Rp 167.302	Rp 133.755	28%
Mar-21	26	29	Rp 5.019.049	Rp 3.881.365	Rp 173.071	Rp 133.840	28%
Apr-21	25	29	Rp 5.019.050	Rp 3.925.123	Rp 173.071	Rp 135.349	28%

Table 34 Table Comparison of Total Electricity Costs and Average Electricity Per Existing Car With Improvements (Con't)

	Work Days	Served Cars	Existring Total Electric Consumption	*Improvement* Total Electric Consumption	Average Existing Electricity Consumption Per Car	Average Electricity Consumption Improvement Per Car	Percentage Improvement
May-21	23	29	Rp 5.019.051	Rp 4.012.638	Rp 173.071	Rp 138.367	28%
Jun-21	25	27	Rp 5.019.052	Rp 3.925.125	Rp 185.891	Rp 145.375	28%
Jul-21	26	27	Rp 5.019.053	Rp 3.881.369	Rp 185.891	Rp 143.754	28%

Aug-21	24	29	Rp 5.019.054	Rp 3.968.884	Rp 173.071	Rp 136.858	28%
Sep-21	26	28	Rp 5.019.055	Rp 3.881.371	Rp 179.252	Rp 138.620	28%
Oct-21	25	28	Rp 5.019.056	Rp 3.925.129	Rp 179.252	Rp 140.183	28%
Average			Rp 5.019.051	Rp 3.936.063	Rp 179.004	Rp 140.349	28%

6. Conclusion

The following are the conclusions of this study :

1. Factors that affect productivity in the car detailing process at the Java Detailing Workshop consist of human, machine, method, and environmental factors. The biggest factor related to the decrease in productivity in the car detailing process in the period November 2020 to October 2021 lies in the energy use obtained by the ratio of the cars served divided by energy use which has a total ratio value of 54 while the factor that can increase productivity is the time of work. each car obtained from the ratio of serviced cars divided by working hours of 84. So that these two factors need to be evaluated and planned for improvement in order to increase productivity in the car detailing process.

2. Based on performance indicators on energy use, November 2020 has the lowest performance indicator with a value of 265 which indicates that November 2020 has the worst productivity from energy use and May 2021 has the highest performance indicator with a value of 720 which indicates that in the month of May 2021 is the month with the best productivity of energy use in the period November 2020 to October 2021.

3. In planning and increasing productivity, it focuses on electricity consumption, improving human resources and also working methods. For electricity consumption itself, it can be done by rejuvenating the polishing machine which previously had 1250Watt power and replaced it with a new generation with 1000Watt power because it can reduce the power consumption of the polishing machine by 25% from the previous one, as well as replacing lamps that previously used 72Watt fluorescent lamps with 40Watt LED lamps which have a high level of the same brightness and can reduce lamp power consumption by 80%, which for the total electricity use of each car decreased by 28% which previously had an average of Rp. 179,004 after the improvement was made to Rp. 140,183. Then to improve human resources and work methods, it can speed up the car detailing work which was originally to complete one car it took 25 hours 22 minutes and after improvement it became 24 hours 12 minutes which shortened the total time for car detailing by 1 hour 10 minutes or equal to 6% faster than before the improvement. By accelerating the processing time, it will directly increase the service capacity and also increase the productivity of energy use.

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