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Optimization of production layout, production process, and supply of materials to increase work productivity in Saramanta homemade

Ratih Setyaningrum[1]*, Firlinda Kirana Erthamevia[1], Sofi Dwi Febriana[1], Ananda Viona Islamay Setyanti[1]
[1]Faculty of Engineering, Industrial Engineering Department, Universitas Dian Nuswantoro, Jl. Nakula I No. 5-11, Semarang 50131, Indonesia

***Corresponding Author**: ratih.setyaningrum@dsn.dinus.ac.id

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ABSTRACT

Saramanta Homemade located in Boja, Kendal is an MSME that produces various cakes. In its production, Saramanta Homemade experiences several obstacles, namely: less than optimal layout; work is done without a work desk, which affects worker he alth and reduces productivity; and decreased profits due to increased costs due to the supply of raw materials. In previous studies, productivity optimization was only focused on layout planning, while this study discusses measuring supply chain performance to increase profits and product design to implementation of designed products. Therefore, researchers use the EFD, SLP, and SCOR methods to solve these problems. The EFD method is used to design an ergonomic work desk with dimensions l = 1610mm, w = 710mm, and h = 1020mm so that it can reduce musculoskeletal complaints as evidenced by a RULA value of 2. The SLP method is used for changing positions between departments, shortening the moving distance by 71%, the total moving time by 50%, and OMH by 47% so that the layout can be optimized through the proposed layout design using Blocplan software. SCM performance measurement with SCOR of 63.83% (average). As well as alternative proposals for selecting suppliers from Semarang, shipping costs of Rp50,000, Emina cheese brand of Rp45,000/kg, and the addition of 4 workers so that expenses are reduced by 5.8%, profits increase by 58.1%, and cash-to-cash cycle time becomes 31% shorter.

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1. INTRODUCTION

Saramanta Homemade is a home industry in the food and beverage sector that produces various sweet cakes. This production house is located in Mijen Merbuh Village, Singorojo District, Kendal Regency. Just like other industries that continue to compete for profit [1]. Saramanta has a target production capacity of around 200 cakes per day to be sent to its 4 official outlets. However, in reality, production achievements did not reach the target in several periods.

In the cake production graph above based on Figure 1, there is an unstable production cycle that occurs in the period from January to June. In fact, worker productivity itself is the standard for measuring production results, both in terms of quality of goods and quantity [2]. This production instability occurs because production activities still use a lot of human power and are carried out with non-ergonomic working postures. This is the cause of employees often complaining of body aches in certain parts, especially the back. This problem can be seen in some data obtained after conducting observations on the MSMEs.

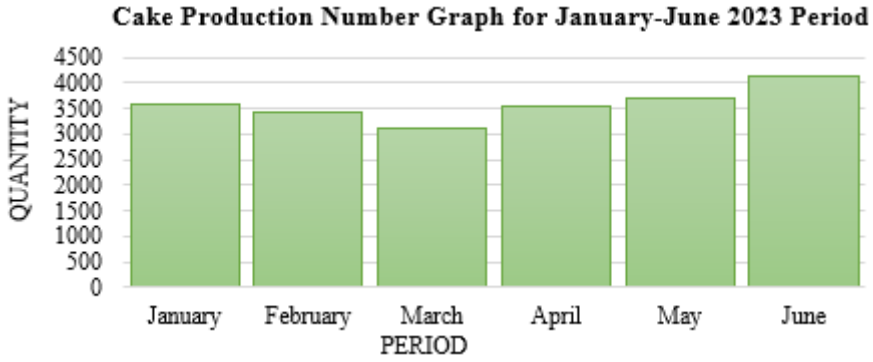
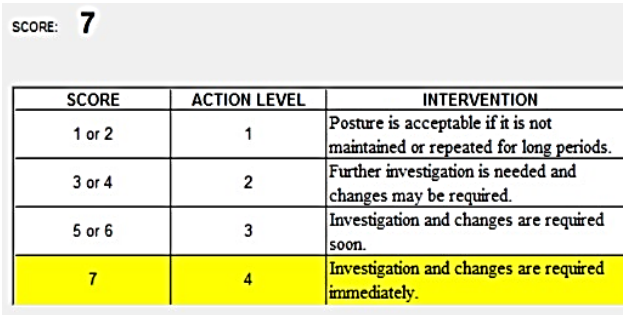


Figure 1. Cake Production Number Graph for the January-June 2023 Period

In the picture above based on Figure 2, it is known that the production process activities are carried out with a sitting work posture on the floor, and processed using the RULA REBA method. The criteria for assessing the degree of angle of the body parts used for this method is trunk of 33º, neck of 0º, upper arm of 154º, lower arm of 33º, wrist of 0º, and leg of 166º, then the results can be seen in Figure 3.

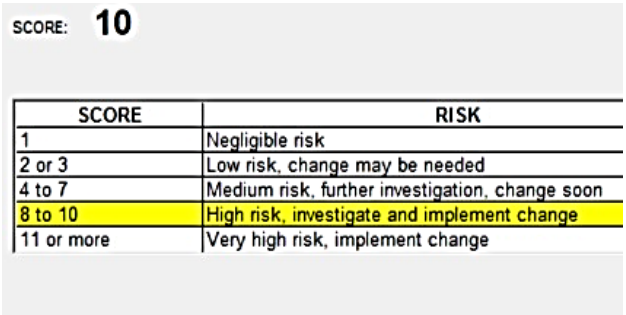
Figure 2. Production process



SCORE: **7**

SCORE	ACTION LEVEL	INTERVENTION
1 or 2	1	Posture is acceptable if it is not maintained or repeated for long periods.
3 or 4	2	Further investigation is needed and changes may be required.
5 or 6	3	Investigation and changes are required soon.
7	4	Investigation and changes are required immediately.

(a) RULA Calculation Result



SCORE: **10**

SCORE	RISK
1	Negligible risk
2 or 3	Low risk, change may be needed
4 to 7	Medium risk, further investigation, change soon
8 to 10	High risk, investigate and implement change
11 or more	Very high risk, implement change

(b) REBA Calculation Result

Figure 3. The results of the calculation of the RULA and REBA scores based on simulations using Ergofellow software from the conditions of the workers in Saramanta Homemade.: (a) The RULA score value obtained is 7 with a medium risk level and immediate corrective action is required.; (b) The REBA score value obtained

is 10 with a high risk level and immediate corrective action is required.

This causes the time to carry out one process to be longer and risks making workers tired because they work in non-ergonomic conditions [3]. In product design, Ergonomic Function Deployment (EFD) is one method for integrating ergonomic aspects that can be used [28]. EFD is a development of the Quality Function Deployment (QFD) method which was originally used in quality management, but EFD focuses on ergonomic aspects that represent user needs and desires into design specifications [4], [29]. The Ergonomic Function Deployment (EFD) method helps identify ergonomic workbench designs, so that it can increase user comfort and reduce musculoskeletal complaints. Optimizing productivity in micro and small businesses (MSEs) such as Saramanta Homemade requires a multidimensional approach involving product design, improving facility layout, and measuring supply chain performance. Previous studies, the problem is represented in one scientific field solution, while in this study the problem will be solved in three scientific fields at once. This study shows that anthropometric-based design using EFD can improve comfort and production performance, and analyzes its effect on productivity when integrated into a full-scale production setting.

In addition to improving work posture, to overcome these problems, inspections can also be carried out to design the layout of facilities in the production area using System Layout Planning (SLP) [5]. This matter aims to ensure partners can obtain recommendations for alternative layouts for the proposed area for production and also that workbench design will have an impact on worker productivity, making it more optimal. Based on the layout at the beginning of the production area and the flow of the production process, we still experience a lot of alternating current. Proposed Factory Layout Design Using Systematic Layout Planning Method [14]. Facility layout redesign and layout relocation using the Systematic Layout Planning Method are effective in increasing efficiency [5] by minimizing travel distance. Previous studies did not involve human factors or ergonomics as the main layout determinants, so they were not optimal in productivity improvement strategies [15], [16].

Running a business requires a cost calculation for that issued in one production run [30]. Likewise with Saramanta Homemade, which takes into account future costs used as consideration to remain running his business. Based on historical data, it can be known that the expenses from January until June experienced instability, which tended to increase and cause a decrease in profits. One reason is delivery costs, which are high due to the supply of raw materials from Semarang, Jakarta and Yogyakarta. One way to suppress the increased expenses in order to make a profit is by making alternative supply chain management models and producing Homemade Saramanta cake. Alternative supply chain management models [6] can be created by identifying supply chain management in MSMEs Saramanta Homemade [7]. However, based on the results of the interviews conducted, Saramanta has never been identified as SCM in its business. Therefore, this research was carried out first for SCM identification at Saramanta Homemade by measuring supply chain performance using the SCOR method and, furthermore, by giving alternatives so that profits can be increased. Alternative supply chain management models [8] obtained based on supplier observations, especially in the Semarang area, get the lowest shipping costs possible, then mapping the flow model is carried out in supply chain management in current conditions, and the supply chain management flow model alternatives are simulated with Power Sim software.

Previous reseach in Supply Chain Management using Interpretative Structural Modelling [20] and macroergonomi approach [19]. Supply chain performance evaluation using the SCOR model is well established, especially in manufacturing and service industries. [10] demonstrated how SCOR can measure critical indicators such as responsiveness and cost. Yet, in the context of MSMEs in the food industry, the SCOR model is underutilized. Integration of SCOR with simulation tools like PowerSim as used [9] enables dynamic decision-making but is rarely adopted in smaller enterprises due to lack of awareness or technical capability.

This study took references from previous journals that discussed Design, Ergonomics, Supply Chain Management (SCM), and Facility Layout Design. That in previous studies there are several things that require improvement or refinement that will be carried out in this study. Previous studies used the AHP and EFD methods to find the best output alternatives that are in accordance with customer desires, while the process is not the main focus. In addition, other studies using EFD to design production process aids [11], [12], the results did help reduce bad posture, but there were other risks that arose such as noise from the aids that could interfere with concentration and focus as well as workers' hearing [12], so it needs to be refined

again [12]. While this study focused on designing an aid that can be used by workers in partners that not only helps improve their work posture but also does not pose other risks that can endanger workers and also refers to the needs of workers that can be seen from the house of quality obtained based on the results of the questionnaire to workers [12]. So that it can create a work system to work with the best quality without sacrificing the comfort of human users [13].

2. MATERIALS AND METHODS

The research method used is quantitative because it consists of calculating values to obtain a result. The data used is the result of interviews with:

1. Nine production workers, namely anthropometric data, work posture, work fatigue and work duration.
2. Owner MSMEs Saramanta Homemade, namely data layouts, initial production area, production process flow, production activity relationships, number of products per production, production capacity, dominant product type (best-selling on the market), data reject product, production cycle time, product delivery cycle time to consumers, direct costs, indirect costs, and number of workers.
3. Supplier raw materials, namely data on product type, volume of each product, number of defects, and cycle time for procurement of supporting raw materials.
4. Consumers, namely demand data, selling price for each product, number of finished product deliveries to consumers, and product return cycle timereject.

This research was conducted to solve three problems at Saramanta Homemade MSMEs, so three methods were used, namely EFD (Ergonomic Function Deployment), SLP (System Layout Planning) with simulation software Blocplan, and SCOR (Supply Chain Operation Reference) with dynamic system simulation software Power Sim.

1. EFD (Ergonomic Function Deployment)
   a) EFD is used to make it easier to design an ergonomic work desk [12] so that it can reduce musculoskeletal complaints by identifying the HOE matrix (House of Ergonomics) and considering worker anthropometric data [22].
   b) The initial stage carried out was identifying worker complaints with the NBM questionnaire (Nordic Body Map) [23].
   c) Next is RULA (Rapid Upper Limb Assessment) and REBA (Rapid Entire Body Assessment) to assess work posture risks [24].
   d) Based on the needs and interests classified in the EFD, an ergonomic work desk is then designed using Inventor software and simulated with CATIA V5 software to measure the value of RULA REBA.
2. SLP (System Layout Planning)
   SLP is used to improve production layout by considering five factors, namely product, quantity, process, support system and time [5] to minimize production process time with materials handling the minimum.
   a) The degree of attachment relationship between departments layout the beginning is depicted in ARC (Activity Relationship Chart),
   b) To be further entered in the table worksheets as processing input data Blocplan software and creating an ARD (Activity Relationship Diagram).
   c) Then the ARD is combined with the floor area requirements described in the SRD (Space Relationships Diagram)
   d) Alternative layout from simulation results Blocplan selected based on the indicators total distance, total time, and OMH with minimum values.
3. SCOR (Supply Chain Operation Reference)
   a) SCOR is used to measure and optimize performance supply chain management Saramanta MSMEs Homemade by paying attention to six perspectives, namely plan, source, make, deliver, return,enable, and five work attributes, namely responsiveness, reliability, agility, cost, and asset management [25], [31].
   b) The next stage is measuring the value of the pairwise comparison matrix (Pairwise Comparison) between the criteria obtained from the AHP questionnaire (Analytical Hierarchy Process) as well as calculating local and global weights so that the performance index and performance value of each indicator level can be known.

c) Then, a recap of the total level one performance values for each month is carried out, and the average is calculated to see the category based on the performance indicator monitoring system [26].

d) Cause-and-effect relationships between entities that influence each other in the Saramanta MSME business process depicted in CLD (Causal Loop Diagrams) to then create a flow diagram (Flow Diagrams), which is equipped with mathematical formulas so that it can be simulated using Power Sim software. Next, a model validity test is carried out to find out whether the model created truly represents the real conditions of Equation 1 [21].

e) Then 2 alternative scenarios were created based on raw materials and the origin of delivery. The best alternative is selected based on the % value of the scenario compared to the initial state with the smallest expenditure and the largest benefit.

3. RESULTS

The following are the results of the data processing that has been carried out to solve problems at MSMEs. Saramanta Homemade:

3.1. Product Design

Design of workbench products used as an alternative solution to the problem of work posture at MSMEs Saramanta Homemade. In this design, we use the wrong one field of knowledge, namely Product Design and Development, which is in this field of science there is a design process and analysis and development of supporting features on products to be designed and used to support design selection efficiently and according to needs. Following the results and discussions on workbench design:

This is processed to determine the size of the product design, by using Ergonomic Function Deployment (EFD) as a study method case. After knowing the anthropometry of each worker, it can determine the table height, table width, and long table corresponding to the anthropometric data obtained. So the size of the table will be designed in accordance with the results of the anthropometry that has been produced, with a table Length 710 mm, table width 1610 mm long, and table height 1020 mm long (see in Table 1).

In the process of measuring anthropometry using ergofellow software to determine the level of data validity. Ergofellow 3.0 has 17 ergonomic methods to evaluate, improve, and in terms of improving work quality to reduce work risk and invrease work productivity and anthropometry data used in this measurement, using the P95 percentile which aims to ensure the workbench can accommodate most workers. This analysis helps in determining which percentile is most critical for design. The method for validating anthropometric data used in the Ergofellow software to show sensitivity in this study is by using the Rula and Reba methods by measuring the body angle and the load experienced in each part of the body, so that the results obtained are RULA with a value of 2 which is better than before using the tool, and REBA with a value of 3 which produces low results for work risks for workers, as can be seen in the Figure 4.

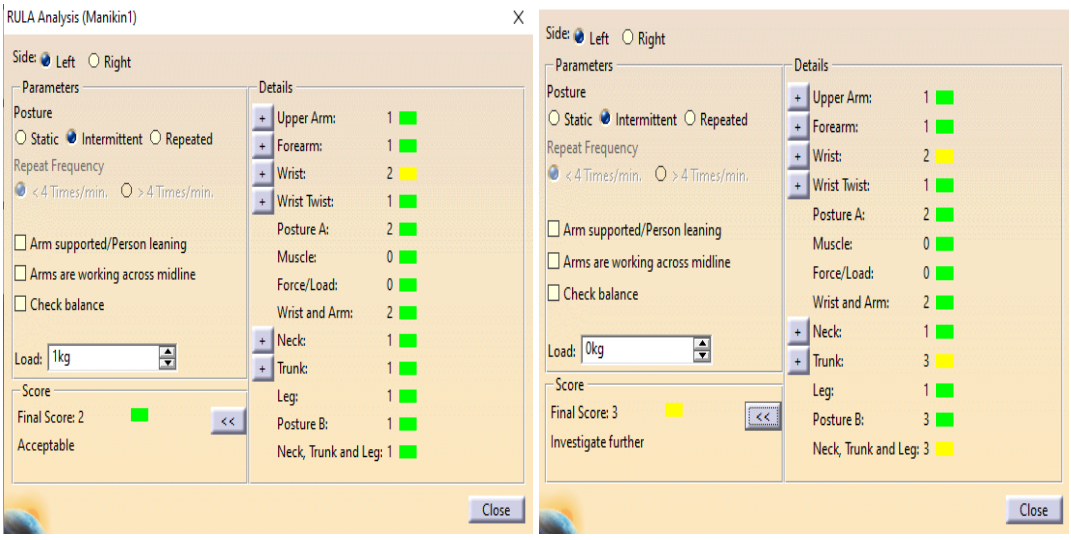


Figure 4. RULA and REBA after using the Workbench.

Table 1. Results of anthropometric data processing

Table Components	Anthropometric Data	Percentile	Dimensional Design (mm)	Reasons for the Election
Table Width	Hand Reach	P95	710	Adjusting the body size of the longer worker so that the designed table can be equipped with weighting features and a sack holder and remains comfortable for all workers to use
Table Length	Hand Span	P95	1610	Adjusting the widest worker's body size so that the designed table can be used from two sides and remains comfortable to use
Table Height	Standing Elbow Height	P95	1020	Adjust the body size of the tallest worker so that the table designed can remain comfortable for all workers to use

Ergonomic Function Deployment (EFD see in Figure 5, is a development of the QFD method (Quality Function Deployment), which involves designing an EFD tool combining the wants or needs of the user with the interests of ergonomics itself. So it obtained a HOE design for making a workbench. Processing of anthropometric data used as a manufacturing basis for ergonomic table design, besides the results from the HOE that will later be used as determining the criteria for the tool that will be designed according to the needs and user interests of MSMEs located in Saramanta Homemade, provides improvements to the amount production cake and capacity of production.

The number of cakes produced can be influenced by the production process time that occurs in one production process. Because that means the lower the time production process, the production quantity will be more and more. So that can affect production capacity.

The following is a production process schedule before and after using the work tool (Workbench). From the results of the data calculation, it can be seen that there has been a change in the process time and production capacity of cakes at Saramanta Homemade MSMEs, it can be seen in the graph line between the time after the repair has decreased which indicates the implementation of the use of the tool, namely a change in production capacity in the 5th month from 9,536 pcs / month to 11,540 pcs / month after using the work tool.

3.2. Layout Improvements

The initial layout of the facility layout at MSMEs Saramanta Homemade currently does not follow a specific rule in the placement of departments or work stations, and the equipment or machines used for the production process do not pay attention to the flow of the production process. This results in limited space for workers to move as well as repetition of activities, which results in a waste of time and an inefficient production process, which will ultimately reduce production productivity. Therefore, it is necessary to redesign (re-layout) the layout of production facilities at MSMEs Saramanta Homemade so that production process activities can run according to the flow of the production process can see in Figure 6.

An operation flow chart is a diagram that illustrates the steps of the material processing process and is used to describe the flow of materials or people from the beginning of a process to the last activity. To find out the time of the cake-making process, only 3 observations were made during the production process in the production area of Saramanta Homemade MSMEs, due to limited research time. Operation Flow Chart 1 has a total time 944,15 mins; Flow Chart 2 has a total time 960,64 mins; and Flow Chart 3 has a total time 946,66 mins.

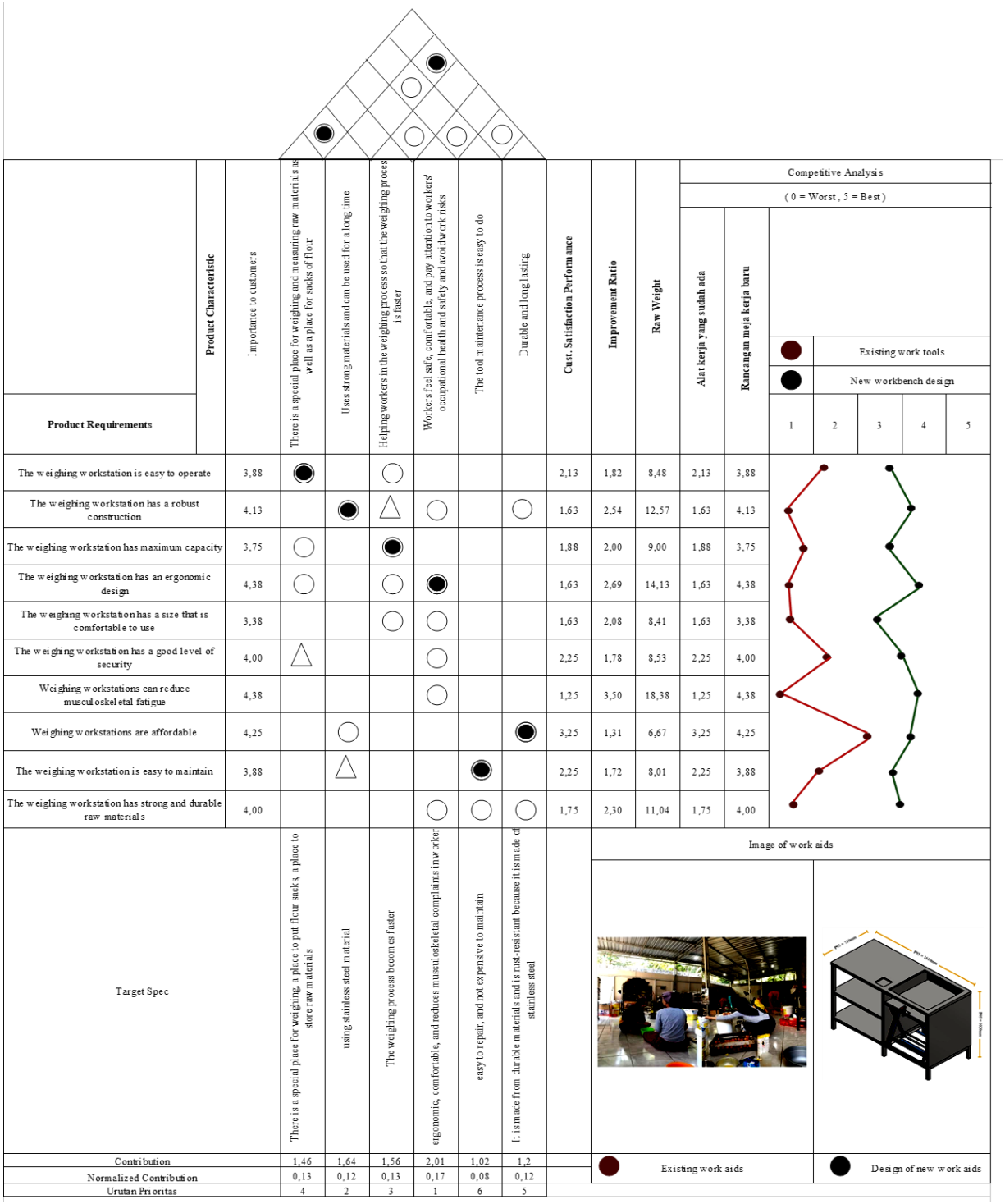


Figure 5. House of Ergonomics

The calculation of the distance of Material Handling Costs for each time transporting goods is determined by the cost of material handling/meter, which has considered the cost of labour. The cost of material handling labour is the percentage of total material movement time with process time. Grand total for distance of initial layout is 46.4 meters; Total distance is 320.9 meters; and Displacement time is 10,382 mins. Currently, the type of transportation used by Saramanta MSMEs Homemade to move materials still uses human labour. The cost of human material handling used to make simulations based on OMH/meter calculations is IDR 166,297 per meter. The results for material handling cost of initial layout is IDR 52.000, by reducing OMH cost per metre by IDR 164/m. Redesigning the layout of production facilities using the Blocplan Software method there are 3 alternative layout proposals. The following is the layout output using blocplan software see in Figure 7.

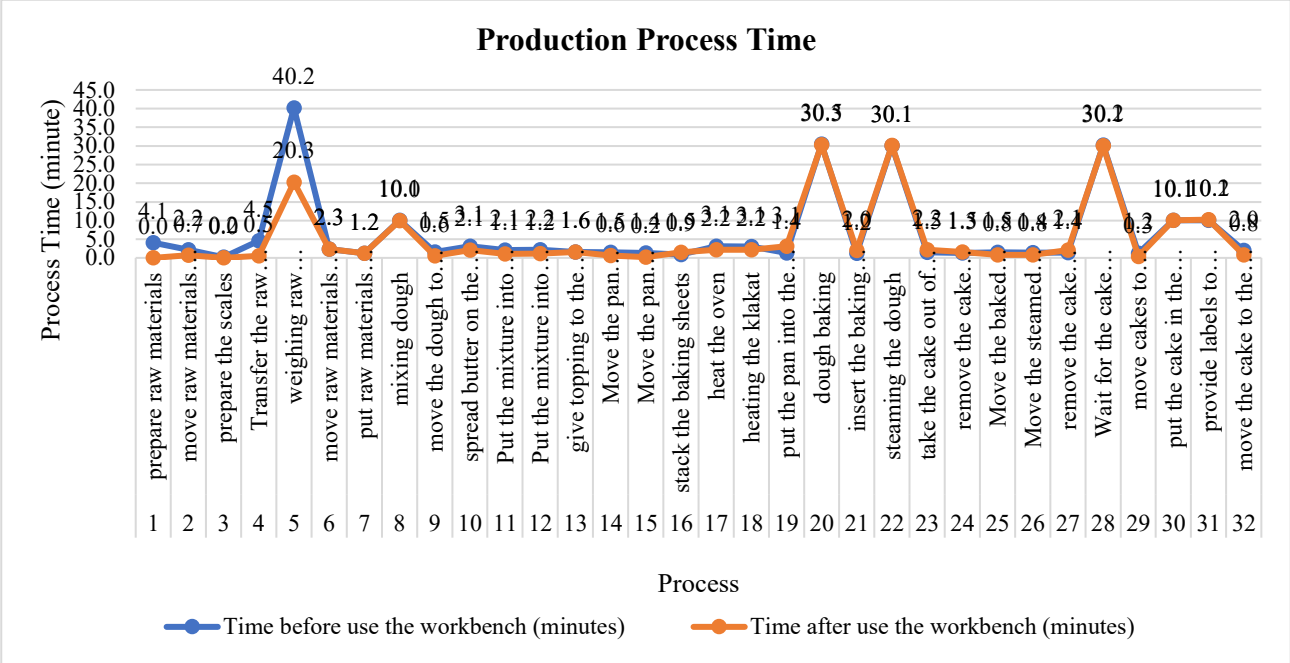
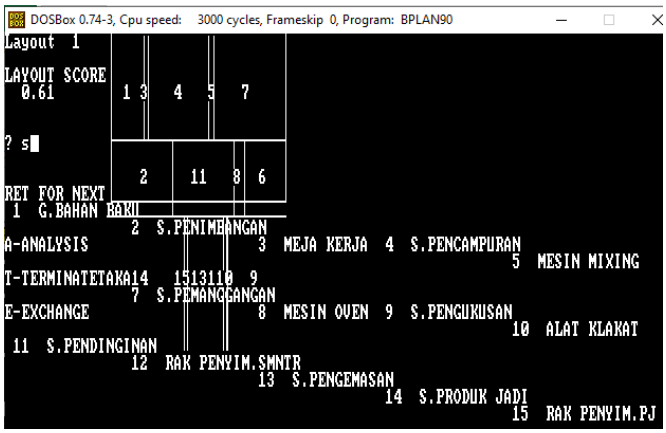
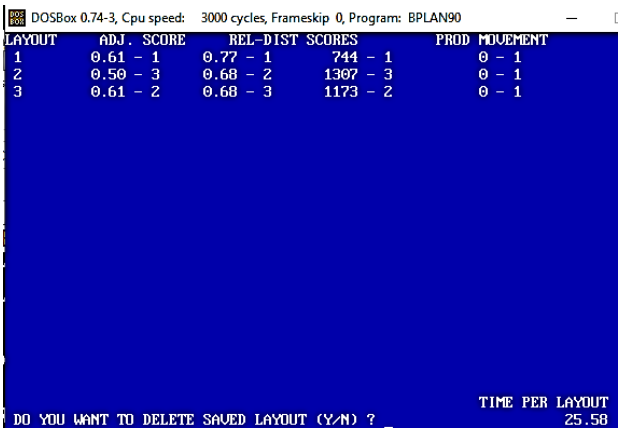


Figure 6. Production processing time before and after using the tool



(a) Design Results of Selected Alternative Layout Proposal from BLOCPLAN



(b) Results of Selected Alternative Layout Proposal from BLOCPLAN

Figure 7. (a) alternative production area layout design.; (b) comparative value of the three alternative layouts of the production area.

One of the indicators in determining the optimization of a layout is the material handling cost material handling costs, if the smaller the material handling costs in a layout, the better the layout on a layout, the better the layout If the distance and time the smaller the value, the more efficient the layout. Based on Table 2 and Table 3 used for decision making.

Table 2. Comparison of Alternative Value from 3 Blocplan Output Layout

Alternative Layout	R-Score	Adjacency Score	Real Distance Scores	Description
Alternative Layout 1	0,61	0,77	744	Selected
Alternative Layout 2	0,50	0,68	1307	Not selected
Alternative Layout 3	0,61	0,68	1173	Not selected

Table 3. Percentage of Productivity Optimization of Initial Layout & Proposed Layout

Alternative Layout	Indicators of Productivity Optimization		
	Total Distance Displacement (m)	Total Time (mins)	OMH (IDR)
Initial Layout	320,95	10,382	Rp 52.500
Alternative Layout	110,67	5,186	Rp 28.000
Percentage	**66%**	**50%**	**47%**

Data collection and retrieval are very necessary to support an opinion and solution to the problems raised. In this study, data taken from the questionnaire results will be processed using 2 tests, namely validity and reliability tests, and based on the questionnaire data that has been collected, the data is then processed using SPSS software. The data tested are the level of consumer interest and satisfaction after improvements have been made can be seen in Table 4. The results of the data processing, it is known that the Cronbach's Alpha value produced from the calculation is 0.894. Because it is worth 0.894, the Cronbach's Alpha value is > 0.6, so the data is stated as reliable data.

Table 4. Data Processing Results Using SPSS

Reliability Statistics		
Cronbach's Alpha	**Cronbach's Alpha Based on Standarized Items**	**N of Items**
,894	,896	10

In the design of the proposed layout alternatives, it is necessary to create a design Layout that has been selected, in order to help visualize the results of the Blocplan output that has been selected. Blocplan output has been selected. The following is the layout design of the selected proposal:

3.3. Supply Chain Model

All activities related to the flow and movement of products and the flow of information from suppliers to end users (customers) at Saramanta Homemade will be described in a supply chain. In cake production at Saramanta Homemade, SCM performance measurements were carried out in 6 periods, namely January to June 2023 using the Supply Chain Operation Reference method with six criteria, namely plan, source, deliver, return, and enable. SCM performance will be obtained from the weighting of the results of the AHP (Analytical Hierarchy Process) [13] questionnaire against the SCOR criteria [17] that have been filled in by Saramanta. So that based on the calculation results, the average value of supply chain performance is 63.83 (Average category).

SCM that has been identified using the SCOR method in Saramanta Homemade has variable values that are influenced by changes in time, and there are interactions between variables that influence each other so that they can be simulated in a dynamic system [27]. The initial stage carried out is manufacturing Causal Loop Diagrams (CLD) see in Figure 9, the CLD of cake production at Saramanta Homemade is as follows.

Figure 8 provides an illustration of the causality diagram of the business process at Saramanta Homemade which has 50 variables from the perspective of indicators of reliability, responsiveness, agility, cost, asset management. These variables influence each other and form a polarity of relationship (correlation). There are two types of relationship polarity, namely positive (+) and negative (-). A positive (+) relationship occurs when a variable increases, the partner variable will also increase in one polarity of the relationship. Meanwhile, a negative relationship (-) occurs when a variable increases, the partner variable will decrease in one polarity of the relationship. The CLD that has been created is then formulated into a flow diagram as follows.

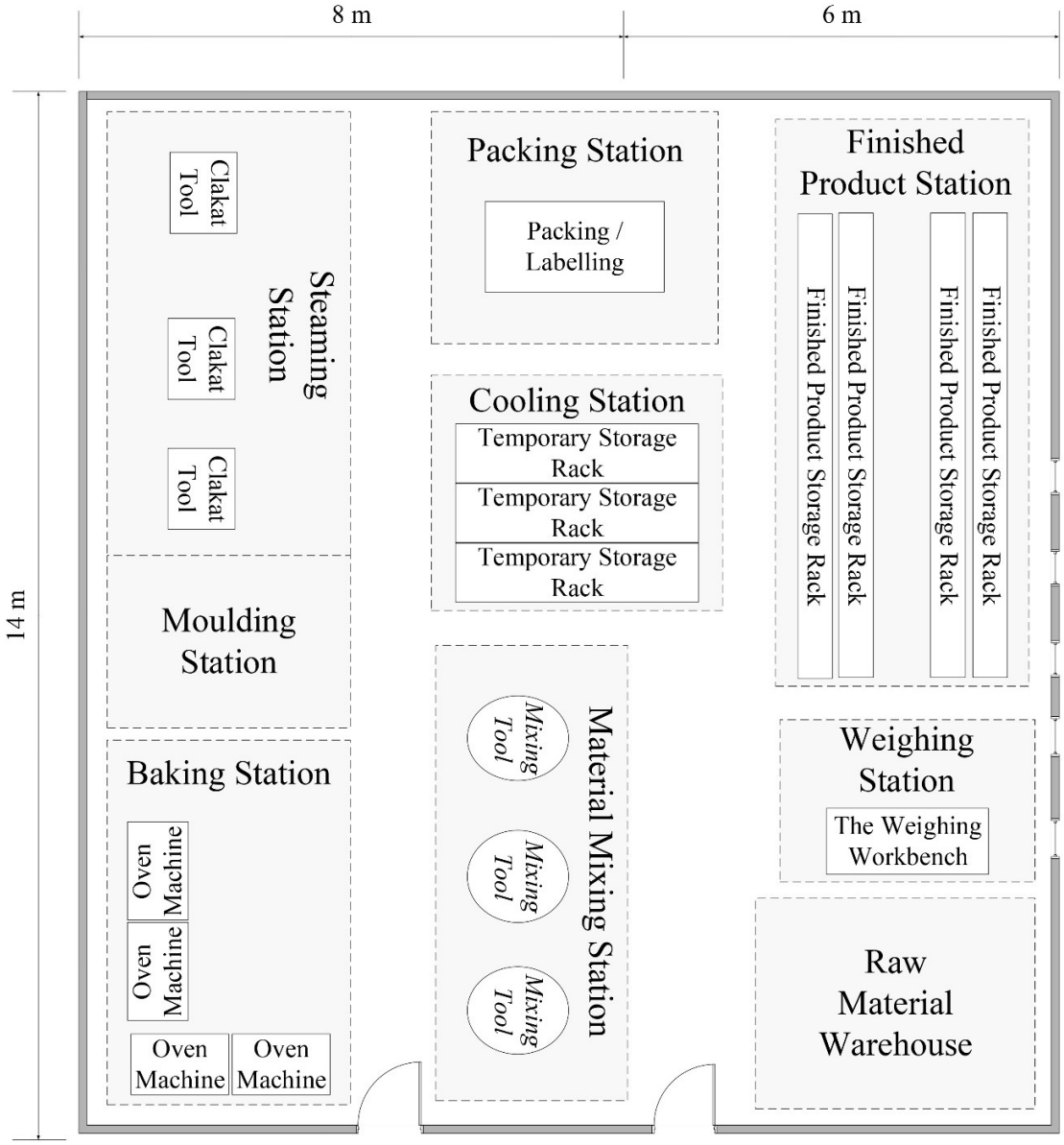


Figure 9. Causal loop diagram

The dynamic system model in Figure 11 has been created based on historical data from Saramanta Homemade for 6 months, namely January to June 2023, will be simulated using data in December 2023 to find out the results of the test error model. With the perspective indicators used are reliability, responsiveness, agility, cost, asset management where each indicator tested is valid. Because the model created was valid, 2 alternative scenarios were then created to increase profits in Saramanta Homemade.

The following is alternative scenario 1 given, namely selecting a cheese with brand Mother's choice at Torta Store (Semarang) and price/kg is IDR 24.000. The butter supplier with brand Wincheez at Plastik Serayu (Semarang) and price/kg is IDR 50.000, of which each supplier is charged a fee of IDR 50.000. Based on the result simulation scenario, alternative 1 can be seen that the shipping costs incurred are IDR 300,000. For the same average production quantity of 3,587 pcs, the costs are IDR 82,003,687 so Saramanta will get a profit of IDR 7,496,313. In preparing alternative scenario 1, it was also known that there were changes in the supply chain experienced by Saramanta Homemade. By purchasing raw materials in the Semarang, this means that delivery of raw materials can be minimized because they are picked up directly by the driver whose delivery costs are only IDR 50,000 per departure for purchasing fuel (gasoline). Procurement of raw materials is carried out once a month, meaning shipping costs of the raw materials spent for 6 months are IDR 300,000, so there is a saving of IDR 900,000 because previously the delivery cost for 6 months was IDR

1,200,000. Choosing a supplier in the city of Semarang will shorten the delivery cycle time so that the total cycle time also decreases. This reduction in cycle time results in more optimal customer fulfilment times and has an impact on increasing profits

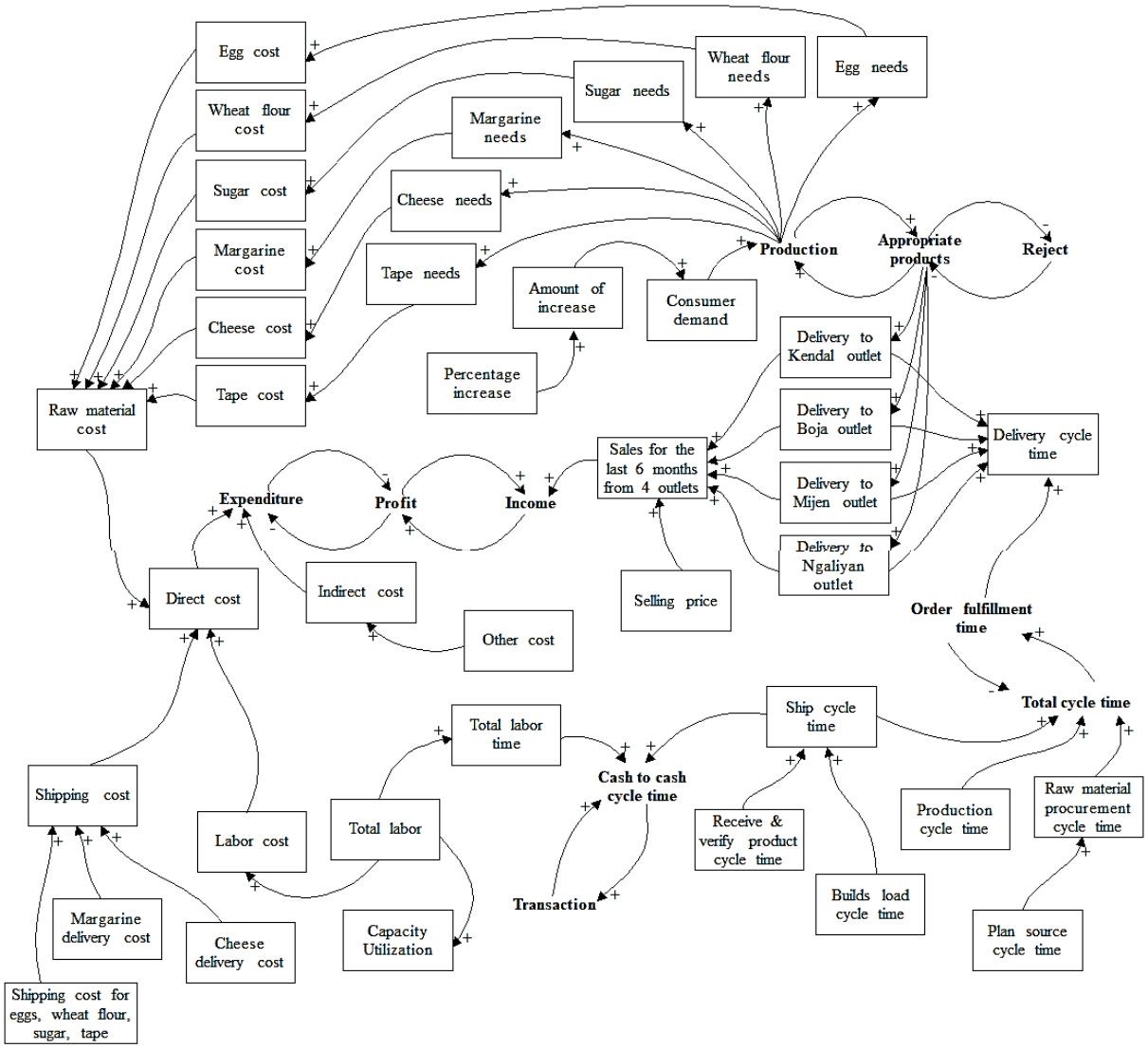


Figure 10. Loop diagram

Meanwhile, for alternative scenario 2, the alternative scenario 2 given is selecting a cheese namely selecting a cheese with brand Mother's choice at Torta Store (Semarang) and price/kg is Rp 24.000. The butter supplier with brand Emina at Warung raina (Semarang) and price/kg is IDR 45.000, of which each supplier is charged a fee of IDR 50.000. Based on the result, simulation scenario, alternative 2 shows that the shipping costs incurred are IDR 300,000. For the same average production quantity of 3,587 pcs, the raw material costs are IDR 39,460,587, so the total costs are IDR 80,927,587, and you will get a profit of IDR 8,572,413. In preparing alternative scenario 2, the number of workers was increased from previously 9 workers to 13 workers and increased labour costs from IDR 13,950,000 to IDR 20,150,000. The increase in the number of workers is aimed at dealing with a surge in demand and reducing cash to cash cycle time. Next, a comparison is made of the two alternatives regarding which alternative will be chosen the comparison is as follows.

4. DISCUSSION

Authors are advised to analyse the outcomes and consider their explication in relation to prior research and the initial hypotheses. The broader context should encompass both the discoveries and their implications. It is also appropriate to underscore potential pathways for future research.

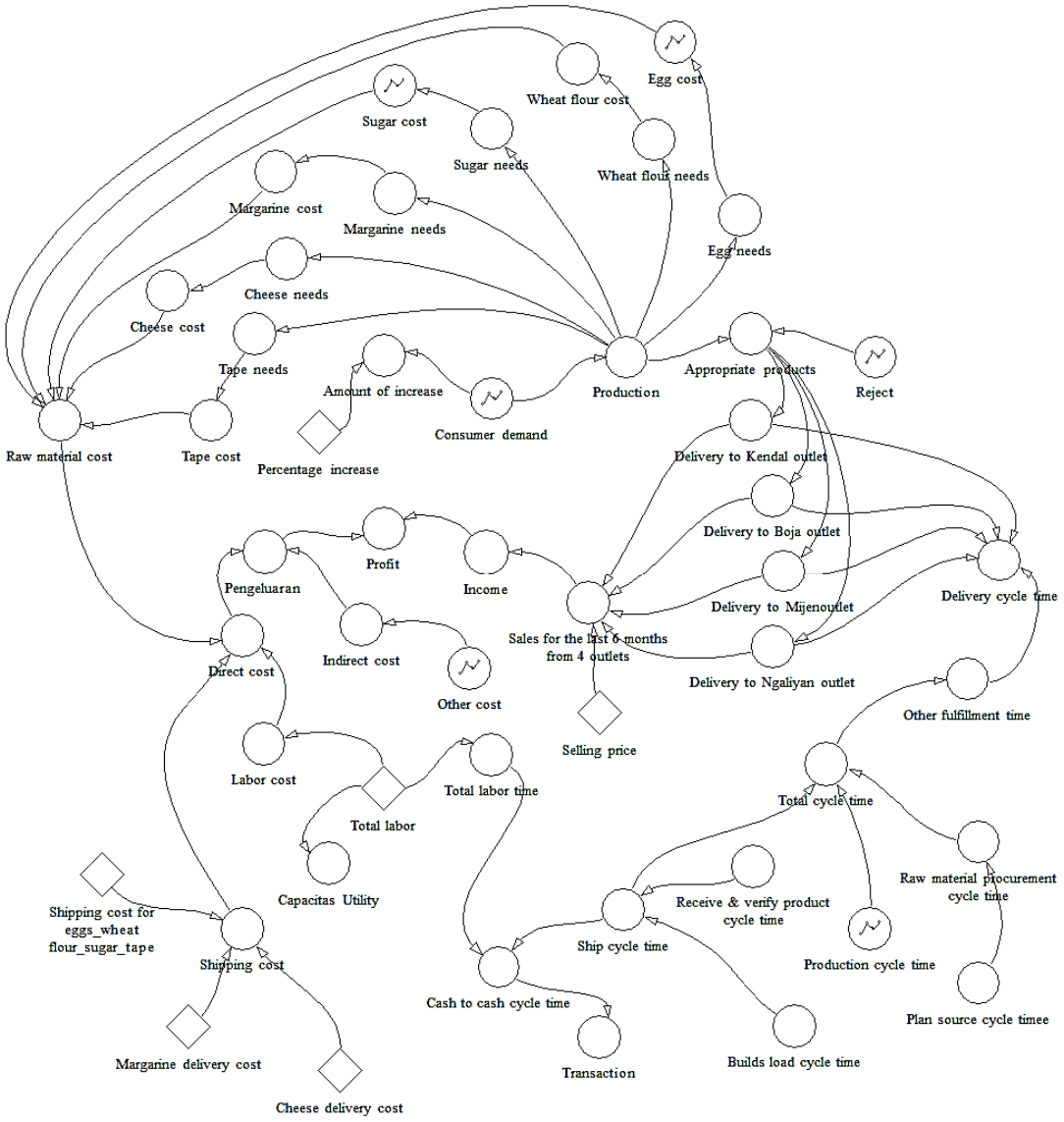


Figure 11. Flow diagram

4.1. Product Design

The design of work equipment in the form of ergonomic work desks was carried out in order to change the working posture of workers at Saramanta Homemade to make it more comfortable and safe and to reduce musculoskeletal complaints which have been a significant problem, and have affected the production capacity of Saramanta Homemade cakes. The design of this tool uses the EFD (Ergonomics Function Deployment) method, which combines user desires with ergonomic principles in work. Research by Anshori (2020) shows that the application of the EFD method in redesigning work tools can improve user comfort and work efficiency, as they applied to coconut graters for housewives [11]. The results of their study showed that ergonomics-based redesign can increase productivity while reducing the risk of injury due to suboptimal work postures. In line with that, this study also shows that the EFD method is effective in designing work equipment that suits user needs, thereby increasing comfort and reducing postural complaints for workers at Saramanta Homemade MSMEs. Apart from that, NBM analysis before design is carried out is the main focus in fulfilling user needs, namely feeling comfortable and reducing pain in certain parts of the body when doing work. With this work tool, after testing the tool, changes occur that can increase production capacity. This happens because the cake making process time can be faster than before using the equipment, so that production capacity can increase, from previously only 9,536 pcs/month to 11,540 pcs/month after using the equipment. This is certainly a solution that can be applied in Saramanta Homemade MSMEs (see in Table 5).

Table 5. Comparison of initial conditions against alternatives

Perspective Indicator	Variable Indicator	Initial Conditions	Alternative Scenario 1	Alternative Scenario 2
Reliability	Production	3587	3587	3587
	Reject	7	7	7
	Appropriate product	3580	3580	3580
Responsiveness	Total cycle time	1,25	1,25	1,24
	% Comparison		**4,0%**	**0,8%**
Agility	Percentage increase	35%	35%	35%
Cost	Expenses	Rp 82.314.010	Rp 82.003.687	Rp 80.927.587
	% Comparison		**4,5%**	**5,8%**
	Income	Rp 85.907.005	Rp 85.907.005	Rp 85.907.005
	Profit	Rp 3.592.995	Rp 7.496. 313	Rp 8.572.413
	% Comparison		**52,1%**	**58,1%**
Asset Management	Cash to cash cycle time	0,42	0,42	0,29
	% Comparison		**4,8%**	**31,0%**
	Description		**Not elected**	**Elected**

4.2. Layout Improvement

Evaluation is conducted to ensure that the results obtained are in accordance with expectations and needs. In this study, the analysis of the facility layout was conducted with the aim of selecting the best layout proposal that can overcome the problems at Saramanta Homemade. Comparison between the initial layout and the proposed layout shows that there is an increase in efficiency in the production process. The evaluation results show that the total distance of material movement is reduced by 60%, the total time of material movement is reduced by 50%, and the cost of material handling related to production costs has decreased by 47%.

This improvement is in line with research conducted by Haryanto (2021), which applied the Systematic Layout Planning (SLP) method in redesigning the layout of production facilities on manufacturing company [16]. The study found that layout optimization was able to reduce the total distance of material movement by 57.33% and reduce the movement time by 41.67%, which has an impact on the efficiency of the production process and reduced operational costs. With this comparison, it can be concluded that the method applied in Saramanta Homemade shows more significant results compared to previous studies, so that the validity of the proposed layout improvements is getting stronger. With the increase in efficiency in material movement and reduction in production costs, the implementation of this new layout is expected to increase worker productivity, make the production process in Saramanta Homemade more effective and efficient, and contribute to increasing company profits.

4.3. Comparison of Supply Chain Simulation with Power Sim Software

Based on the results of the Saramanta Homemade supply chain simulation using Power Sim software, it was found that the responsiveness cycle time in alternative scenario 1 increased by 4%, whereas in alternative scenario 2, the increase was only 0.8%. However, in terms of cost indicators, total expenditure in alternative scenario 1 decreased by 4.5%, while in alternative scenario 2, the reduction was greater at 5.8%. From a profitability perspective, the profit gained in alternative scenario 1 increased by 52.1%, whereas in alternative scenario 2, the average increase reached 58.1%. Additionally, in terms of asset management indicators, alternative scenario 1 had a cash-to-cash cycle time of 4.8%, while alternative scenario 2 showed a more efficient result at 31%, indicating a faster capital turnover. Based on these findings, it can be concluded that alternative scenario 2 is the best choice for improving Saramanta Homemade's operational efficiency and profitability. This research align with the study conducted by [18], which applied supply chain analysis and a Dynamic Systems Model using Power Sim. So that the cost of importing electronic products from the port to the importer's warehouse can be evaluated. Their study demonstrated that supply chain optimization

successfully reduced total expenditure costs by up to 6.2% and improved asset management efficiency, allowing businesses to lower operational expenses and increase profitability. The research also emphasized that using a Power Sim-based simulation provides more accurate insights into supply chain planning, enabling more effective strategic decisions in managing transportation costs, raw material procurement, and workforce allocation.

Based on the analysis and validation with previous research, the best scenario to implement is alternative scenario 2, in which the selected raw material suppliers are Mother's Choice margarine at IDR 24,000/kg from Torta Store Semarang and Emina cheese at IDR 45,000/kg from Warung Raina. The shipping cost from each supplier is IDR 50,000, and four additional workers will be employed to support increased production capacity and operational efficiency. With this strategy, Saramanta Homemade can optimize its supply chain more efficiently, reduce operational costs, accelerate capital turnover, and achieve sustainable profit growth.

5. CONCLUSION

How to optimize worker productivity by designing work desks using the EFD method (Ergonomic Function Deployment) combines ergonomic aspects and user needs, which can reduce musculoskeletal complaints, as evidenced by changes in work posture using the rula reba method, with results before using the rula tool worth 7 and after using the rula tool worth 2 which is proven by test testing validity and reliability that demonstrate value Cronbach's Alpha of 0.89, which means the data is valid.

In the layout of the proposed improvements, it is also aimed at minimizing the production process in order to reduce costs material handling, where the proposal is a distance approach material handling production that can shorten the total moving distance by 71%, total moving time by 50%, and OMH by 47%.

Results of measuring supply chain performance using the SCOR method at Saramanta Homemade, namely 63.83% included in the average category (Average), meaning that the supply chain flow is good enough and if improvement is done then it will be better. The proposed improvements made to increase the profits of Saramanta Homemade MSMEs are the selection of suppliers margarine Mother's Choice IDR 24,000/kg from Torta Store Semarang and suppliers Emina cheese IDR 45,000/kg from Warung Raina Semarang with shipping costs IDR 50,000 from each supplier as well as the addition of 4 workers so the expenses decrease as big as 5.8%, its profits increased by 58.1%, and cash to cash cycle time31% shorter.

Suggestions that can be given for further research are to conduct an analysis of the materials used in designing ergonomic work desks in order to obtain a better design, use several products as objects so that the layout determination can be more detailed, consider investment costs in the proposed layout and compare other layout theories in order to obtain a better indicator assessment, make a complete and documented compilation of Saramanta Homemade information and data to make it easier to assess performance, and be able to further evaluate other supply chain performance perspectives, such as reliability and responsiveness.

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