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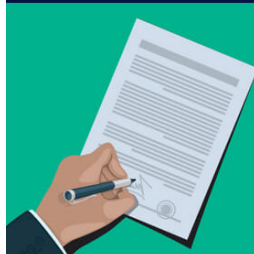
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IWATA RASHI SHOP EMPLOYEE PLACEMENT OPTIMIZATION TO MINIMIZE SERVICE TIME

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ABSTRACT: Iwata Rashi Shop is one of the restaurants in Bekasi. This shop applies the concept of the first Japanese nuance in its surroundings. This shop was founded in January 2010 which serves a variety of Japanese specialties such as Ramen and Takoyaki. The problem at the Iwata Rashi Shop is a problem in production and service time which is considered to be less than optimal even though a rotational assignment has been assigned to each employee. Therefore it is necessary to place appropriate employees to increase production time and service time. In achieving this goal, a method is needed that can solve this problem, the method that can be used is the Assignment Method using the Hungarian Method. The Assignment Method is the science of setting up individuals to do the right job and according to their abilities, so the time spent on carrying out these tasks can be minimized to reduce production time/production costs. This method was chosen because it has a simple problem solving that can be easily understood. Another advantage of the assignment method is that each human resource can only be assigned to a single type of work, so workers can more focus on doing their jobs. This research was conducted to find the right assignment for each employee so that later each worker can be assigned an assignment using the Assignment Method. Thus it can be seen the level of effectiveness before using the Assignment Method and after using the Assignment Method. Based on the results of the analysis and discussion, it can be concluded that the assignment method has proven to be effective for solving assignment problems at Iwata Rashi Shops who want optimal production time and service time. With the results of Task P1 (chasier) done by R (Rizal) with a processing time of 0.50 Seconds, Task P2 (Cooking Ramen) is done by D (Danis) with a processing time of 10.07 Minutes, Task P3 (Cooking Takoyaki) is done by S (Soleh) with a processing time of 10.01 minutes. So, it can be concluded that using the assignment method has optimal results, namely 20.58 minutes.

Keywords: *assignment method, Hungarian method, optimal, worker placement*

I. INTRODUCTION

Indonesia's current economic development is a challenge for the business world, both MSMEs and large companies. In this case various kinds of problems often arise, one of which is the problem of Human Resources. HR has an important role to determine the successful performance of every organization (Aritonang, Hasibuan, & Hondro, 2020). The production process that runs smoothly cannot be separated from the proper empowerment of human resources because each employee has different abilities and potential. Therefore it is necessary to have the right assignment method for each employee.

The Assignment Method is one of the methods used to find the most efficient assignment between workers and existing jobs. (Mulyono & Rully, 2019). The main goal of this assignment method is to minimize the time spent on each task. According Ristono (2011) (Arya, Jono, & Mindhayani, 2021), Assignment is the science of placing individuals in carrying out tasks according to their abilities, so the time spent on carrying out these tasks can be minimized to reduce production time and production costs. The assignment model is an advanced type of Linear Programming. Therefore Linear Programming can solve the optimal solution of an assignment problem. The assignment method has been developed for more efficient algorithm problems. Another name for the assignment method is the Hungarian method.

Japanese food has been recognized worldwide as food that has a delicious and unique taste. That's what makes the mushrooming of Japanese restaurants in Indonesia. Iwata Rashi's shop is one of the restaurants that

has been established since January 2010, serving various types of Japanese specialties, such as Ramen, Takoyaki and others. At first the idea of establishing this restaurant was started by Danis' father, the restaurant owner, who worked in Japan and the environment where he lived did not yet have a typical Japanese restaurant. From there came the idea to open a Japanese-themed restaurant. Currently the restaurant has 2 employees whose job is to cook ramen and cook takoyaki, he himself has a duty to be a cashier.

The problem with Iwata Rashi's shop is a problem in production and service time which is felt to be not optimal even though assignment rotation has been assigned to each employee. Therefore it is necessary to place appropriate employees to increase production time and service time. In achieving these goals required a method that can solve the problem. One method that can be used is the Assignment Method such as the Hungarian Method. This method was chosen because it has a simple problem solving that can be easily understood. Another advantage of the assignment method is that each human resource is only assigned to do a single job, so that a worker can complete his task with more focus (Purba, 2018).

This research was conducted with the aim of finding the right assignment for each employee so that later each worker can be assigned an assignment using the Hungarian Method. Thus the level of effectiveness can be calculated before using the Assignment Method and after using the Assignment Method.

At Iwata Rashi's shop, the current production process and service time have not been carried out properly and are considered to be not running optimally. Thus, the application of the Assignment Method can produce a more efficient and optimal assignment arrangement compared to the current assignment rotation.

II. LITERATURE REVIEW

In 1955, a Hungarian mathematician named Harold Kuhn discovered the concept of assignment, which is often known as the Hungarian Method. (Meik, Ilwaru, Rijoly, & Tomasouw, 2022). The Hungarian Method has the main criterion, which is to pair one by one so that it can cover $n!$ assignment to be carried out. The assignment method includes minimization (cost, time) or maximization challenges present in the assignment problem eg. profit and sales volume.

Assignment Theory:

One method that can be used in the problem of time efficiency and production costs is to use the Assignment Method with the name Hungarian Method, because with the algorithm that is owned by the assignment method an optimal solution can be found.

Assignment method is a method used in solving problems related to the assignment of human resources to complete the work. These resources can be people with tasks or people with machines. The assignment method has another name, namely, the Hungarian Method. The Assignment Method is more effective in solving relatively difficult assignment problems where the number of workers with jobs is relatively large. The assignment method can also be used for a relatively small number of workers and jobs by counting one by one or by making a combination list. (Rusdiansyah, Handrianto, Supendar, & Tuslaela, 2022)

The Assignment Method arises due to an assignment problem. The beginning of the emergence of assignment problems is the placement of employees in several fields that are considered less efficient and optimal (Aritonang et al., 2020). Employees are the main actors in overcoming problems in assignments because the skills possessed by each employee are different. The number of workers also affects the execution of existing work (Parningotan & Pangastuti, 2022). So that an alternative method is needed in carrying out these tasks to obtain more optimal time efficiency.

Assignment Model:

The Assignment Model uses the Quantitative Method which regulates Human Resources with a single type of work (one-to-one basis). Each Human Resources (Assignee) is given a special assignment, for example a Worker A with task 1. A Worker B with task 2 and a Worker C with task 3.

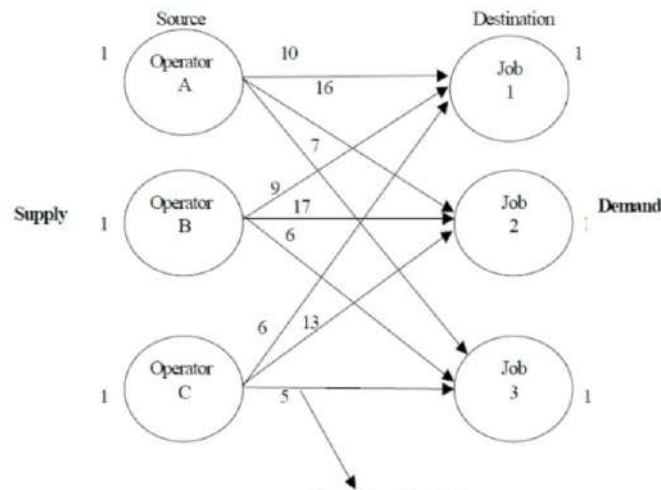


Figure 1. Assignment scheme

To solve the Assignment Problem using the Assignment Method, an assignment completion table is needed like the following example:

Table 1. Table of data for assignment method

Assignment / Assignee	1	2	3	...	n
1	A ₁₁	A ₁₂	A ₁₃	...	A _{1n}
2	A ₂₁	A ₂₂	A ₂₃	...	A _{2n}
3	A ₃₁	A ₃₂	A ₃₃	...	A _{3n}
...
n	A _{n1}	A _{n2}	A _{n3}	...	A _{nn}

Previous Research

Previous research with the assignment theme has been carried out by (Mardiani, 2020) entitled "Implementation of the Hungarian Method in Optimizing Employee Assignments of CV. Paksi Teladan" with results proving that the Hungarian method can minimize production costs and optimize operator performance. And next (Arya et al., 2021) with the title "Optimal Placement of Kitchen Employees to Increase Productivity Using the Hungarian Method" results that applying the Hungarian method can increase company productivity. Then conducted research by (Lutfi et al., 2021) with the title "Optimizing the Assignment of Expedition Service Employees Using the Hungarian Method" concluded that the Hungarian method can optimize shipping costs compared to before using the Hungarian method.

Based on previous research, it can be concluded that the Hungarian method or assignment method can be used to optimize production time and minimize production costs.

III. METHOD

This research was conducted at the Iwata Rashi Shop which required data on how long it took to make one bowl of ramen and one portion of takoyaki and how long it took to serve the cashier. Time data is also needed before the assignment method is carried out and after the assignment method is carried out.

Collection of appropriate and efficient data is a first step of the research objectives. There are also methods used in data collection, namely as follows:

- a. The flow of production time is how long it takes in each existing assignment and then how long it takes after completion using the Assignment Method or the Hungarian Method.
- b. Sampling of time data was carried out using a Stopwatch. When measuring working time directly.
- c. Quantitative data is collected by collecting primary data directly.

There are 6 stages that can be carried out in processing this data, namely:

- 1. Identify and determine the amount of data to be used which will later be entered into the assignment table. (Priya & Ramesh, 2019)
- 2. Look for the smallest number or value in each row. After that, subtract all rows of values in that row with the smallest existing value.

3. All rows and columns must have a zero value in them. If in a column there is a column that does not yet have a zero value, then you have to find the smallest value again in that column and subtract again with the smallest existing value.
4. Draw a line of all 0 values by drawing the minimum number of lines.
5. If the last table is minimum, the next step is to find a column or row that contains a zero value. Then choose the value 0.
6. Finally, if one zero value has been found in each row and column, then the assignment method has been completed or is optimal.

IV. RESULT AND DISCUSSIONS

At Iwata Rashi Shop there are 3 employees and 3 assignments, namely cashier, cooking ramen, and cooking takoyaki. The assignment problem experienced is how to obtain optimal production time and service time to optimize work time. This problem can be solved using the assignment method or the Hungarian method. Based on the assignment method, the data obtained earlier is entered into the assignment table to facilitate the calculation of the assignment schedule.

The data used is data on the work of each employee who was examined at the Iwata Rashi Shop:

Table 2 Data of Placement of Employees Before Using the Assignment Method

Employee	Task	Running Time (In Minutes)
Danis	Cashier	0.42
Rizal	Cooking Ramen	13.30
Soleh	Cooking Takoyaki	10,01

Follow is data observation of employee working time.

Table 3. Employee Working Time (Minutes)

EMPLOYEE	ASSIGNMENT		
	P1	P2	P3
D	0.42	10.07	11.18
R	0.50	13.30	12.24
S	0.44	12.59	10.01

Note:

P1: Cashier

P2: Cooking Ramen

P3: Cooking Takoyaki

D: Danis

R: Rizal

S: Soleh

Optimal Assignment Determination

The following are the steps that must be taken in data processing using the assignment method:

1. Arrange the assignment table using employee elements in the column section and the assignment section in the row section as shown in Table 1
2. Choose the time with the smallest value. After that, subtract all rows of values in that row with the smallest existing value. First column with Cashier work elements (P1):
 - a. $0,42 - 0,42 = 0$
 - b. $0,50 - 0,42 = 0,08$
 - c. $0,44 - 0,42 = 0,02$
 Second column with Ramen Cooking work element (P2)
 - a. $10,07 - 10,07 = 0$
 - b. $13,30 - 10,07 = 3,23$

c. $12,59 - 10,07 = 2,52$

The third column with the working elements of Takoyaki Cooking (P3)

a. $11,18 - 10,01 = 1,17$

b. $12,24 - 10,01 = 2,23$

c. $10,01 - 10,01 = 0$

3. After performing calculations on the data manually, the results of these calculations are entered into a table like Table 4 as follows:

Table 4. Assignment Method Calculation (Minutes)

EMPLOYEE	ASSIGNMENT		
	P1	P2	P3
D	0	0	1.17
R	0.08	3.23	2.23
S	0.02	2.52	0

Based on the table above, a zero (0) value is obtained in each column. It can also be noted that in the rows from table 2 there are rows that do not have a zero (0) value in them. So, it must be subtracted with the smallest value the same as before. Rows and other columns that have a zero (0) value in them can be ignored first.

The Second row:

1. $0,08 - 0,08 = 0$

2. $3,23 - 0,08 = 3,15$

3. $2,23 - 0,08 = 2,15$

Based on the results of the calculations that have been done earlier, the results of these calculations can be entered in Table 5, as follows:

Table 5. Assignment Method Calculation (Minutes)

EMPLOYEE	ASSIGNMENT		
	P1	P2	P3
D	0	0	1.17
R	0	3.15	2.15
S	0.2	2.52	0

The assignment schedule can be determined by drawing a line on the row or column in Table 3. First, it is necessary to select the row and column that has the highest zero (0) value first. So, the first line made is a vertical line. As an example in the following table:

Table 6. Determining the Minimum Line

EMPLOYEE	ASSIGNMENT		
	P1	P2	P3
D	0	0	1.17
R	0	3.15	2.15
S	0.2	2.52	0

The next step is to draw lines horizontally and vertically in rows or columns that have a number or value zero (0) in it. As in table 7 below:

Table 7. Determining the Minimum Line

EMPLOYEE	ASSIGNMENT		
	P1	P2	P3
D	0	0	1.7
R	0	3.15	2.5
S	0.2	2.52	0

In processing data using the assignment method, it can be concluded that if the number of lines in the rows and columns has the same number as the number of assignment elements and worker elements, the data is considered optimal. Conversely, if when processing the data a discrepancy is found between the number of workers and assignments with the number of rows and columns crossed out, the data is considered to be still not optimal. (Arya et al., 2021). If the data is not optimal, it is necessary to re-process the data by following the steps of the assignment method from the start.

In this study, it was found that there were 3 workers with 3 assignments, and there were also 3 lines. So it can be concluded that the data in the table has been optimal. The employee placement data after using the assignment method is presented in Table 8 below:

Table 8. Placement of Employees After Using the Assignment Method

Employee	Task	Running Time (In Minutes)
Danis	Cooking Ramen	10.07
Rizal	Chasier	0.50
Soleh	Cooking Takoyaki	10.01

In the above calculation it can be concluded that the total work done from P1, P2 to P3 is 20.58 minutes. The time to complete the task at the cashier (P1) takes 0.50 seconds. In Cooking Ramen, the processing time for making one bowl of Ramen is 10.07 minutes. Meanwhile, Cooking Takoyaki (P3) takes 10.01 minutes to process.

After doing manual calculations using matrix calculations, the next step is to complete the assignment method using the POM-QM Software. This step is carried out to test the correctness of the calculations manually that have been completed. Following are the steps to complete the assignment method using POM-QM:

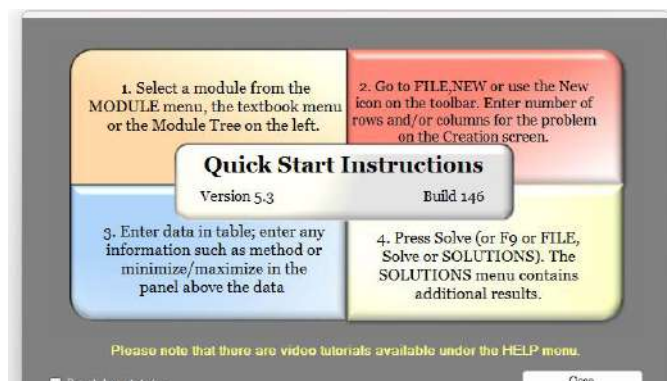


Figure 2. Opening POM-QM Software

Inputting data on POM-QM as follows:

ASSIGNMENT-DATA			
	P1	P2	P3
D	42	1007	1118
R	50	1330	1224
S	44	1259	1001

Figure 3. Inputting data in the data

To “Solve” problem used POM-QM

ASSIGNMENT SOLUTION			
Optimal solution value = 2058	P1	P2	P3
D	42	Assign 1007	1118
R	Assign 50	1330	1224
S	44	1259	Assign 1001

Figure 4. The result of POM-QM

Based on the results of data processing using POM-QM Software, it can be concluded as follows: Task P1 (Kasir) is done by R (Rizal) with a processing time of 0.50 seconds, Task P2 (Cooking Ramen) is done by D (Danis) with a processing time of work for 10.07 minutes, Task P3 (Cooking Takoyaki) was done by S (Soleh) with a working time of 10.01 minutes. So, it can be concluded that processing data manually or using POM-QM Software has the same results, namely 20.58 minutes. So that it can be seen that the manual calculation has been done correctly.

V. CONCLUSSION AND SUGGESTIONS

Based on the results of the analysis that has been done, it can be concluded that the assignment method has proven to be effective in solving assignment problems at Iwata Rashi Shops who want optimal production time and service time. The following are the results of data processing using the assignment method:

1. The cashier assignment was done by Rizal with a working time of 0.50 seconds, the Ramen Cooking Assignment was done by Danis with a processing time of 10.07 minutes, and the Cooking Takoyaki assignment was carried out by Soleh with a processing time of 10.01 minutes.
2. Placement of employees using the assignment method results in a more optimal total productivity time of 20.58 minutes which previously took 23.73 minutes to work on.

Iwata Rashi's shop needs to apply the assignment method to their business if they want more optimal and efficient production and service times. For further research, other methods can be used which can also solve assignment problems to help MSMEs increase their production time.

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