

Analysis of Employee Assignment Costs of Gemoy Billiard And Coffee Shop Using the Assignment Model Method

Jovan Martin Nababan^{1*}, Anggie Joely Artikha², Lita Angel Lina Nainggolan³, Ahmad Albar Tanjung⁴

^{1,2,3,4}Sekolah Tinggi Ilmu Manajemen Sukma, Medan, Indonesia

Email Corresponding: jovannababan24@gmail.com¹, anggiejoely17@gmail.com², litaangellina@Gmail.com³, Alb4rt4anjung@gmail.com⁴

Abstract. The purpose of this study is to understand the differences in problem-solving ability and character among employees in a corporate environment. This study also discusses the differences between Manda and Riki, as well as PanThe purpose of this study is to understand the differences in problem-solving ability and character among employees in a corporate environment. This study also addresses the differences between Manda and Riki, as well as Pandi and Rini. The population of this study consists of four people who work at Gemoy Billiard and Coffee Shop, and the method used in sampling is the Hungarian method, which is one of the algorithms used to solve assignment problems, this method was discovered and published by Harold Kuhn in 1955 [2]. The results showed that Employee J1 was placed in position M1 (Cashier), Employee J2 was placed in position M4 (SPV), Employee J3 was placed in position M2 (Kitchen), and Employee J4 was placed in position M3 (Bar). these results can be obtained from the assignm model or assignment method carried out by business owners to see the abilities of each employee.

Keywords: Employee Assignment Cost, Gemoy Billiard And Coffee Shop, Assignment Method, Hungarian Method

1. INTRODUCTION

One of the most common problems faced by businesses is job allocation, which involves determining responsibilities among employees. Each individual must have different skills and knowledge in preparing the tasks assigned by the supervisor. Therefore, the purpose of this challenge is to ensure that each responsibility is tailored to the capabilities of each individual. In this way, the utilization of employee performance to complete each task optimally can be done well [1].

The assignment problem is a disciplinary attitude that examines the application of policies and rules to individuals, so that they can complete tasks according to their respective abilities and capacities [2]. The assignment problem is concerned with the arrangement of objects used to complete a particular task, with the intention of maximizing profits while reducing distance and costs for the business being run [3].

In general, there are two general approaches to solving employee assignment problems: manually or with the help of applications that are done in order to achieve an optimal solution, several methods can be applied manually, such as the Hungarian Method, Brute Force Algorithm, or Penalty Method. And one of the application assistance tools that can be used is the QM for windows application which can be downloaded via the internet [4].

Production management often faces challenges in determining the optimal allocation of resources and utilizing various types of productive resources. This challenge is known as the assignment problem, which is a special form of linear problem [5].

Gemoy Billiard and Coffee Shop is a business that combines billiard and culinary entertainment in one comfortable and attractive location. As well as offering a unique experience for visitors who want to relax, socialize, and enjoy quality time with friends or family, this business has just opened in 2024 and its location is on Jl. Sisingamangaraja in front of Kemang Indah fruit market, this business is suitable for students, workers, and families who want to spend time together.

Billiards is a sport that requires a lot of concentration. Endurance and good physical condition are very important in this game so that players can play with calm and enthusiasm. One of the most famous types of billiards is nine-ball. Players start with ball 1 and progress to ball 9, placing the ball into the hole with great accuracy. The winner is determined by the first person to score 9. This one sport is often underestimated, but in fact it has great benefits for training concentration [6].

Operations Research is the study of solving linear programs using graphical methods and simplex methods. In addition, important concepts such as duality, sensitivity analysis, assignment problems, transportation problems, network analysis, and inventory will also be discussed. Participants will also be given the opportunity to apply the theory they have learned through practice using software such as QM for windows [7].

The focus of this research is to find a concrete solution in optimizing employee assignment costs at Gemoy Billiard and Coffee Shop. This research is also expected to broaden the understanding of the application of the assignment model method as a strategic tool in assignment cost management, so that work completion time can be optimized [8].

2. METHODOLOGY

This research is an applied study conducted directly in the field, where researchers visit the business location directly to conduct interviews with business owners so that data can be obtained, and will be tested manually and also using the QM application [9].

2.1 Location and Time of Research

This study was conducted at Gemoy Biliard and Coffee Shop which is located at Jl. Sisingamangaraja, Siti Rejo I, Kec. Medan Kota, the research time was conducted in November-December 2024.

2.2 Object of Research

This study will examine the performance of employees at the Bola Gemoy Biliard and Coffee Shop business to minimize employee salary costs [10].

2.3 Data Analysis

Data analysis involves an explanation of the process of searching and collecting data, which aims to provide an overview of the results that will be obtained in the future [11], and this research uses several data collection sources and methods.

2.3.1 Data Source

a. Primary Data

The data collected in this research is done through direct visits in the field. The process includes observation of testing activities and direct interviews with Supervisors at Bola Gemoy and Coffee Shop. The information collected includes nominal salary data and personal data from each employee from various divisions [12].

b. Secondary Data

This research not only uses primary data but also uses secondary data obtained through literature review and analysis of documents provided by business owners [13].

2.3.2 Data Collection Methods

a. Observation

Data collection can be done through observation and recording of data collected through procedures agreed upon by researchers and business owners, this process is known as observation, which in this case is applied to Gemoy Billiard and Coffee Shop business actors [14].

b. Interview

Researchers conducted a question and answer session with the company owner to obtain information related to divisions, employees, and the amount of salary as well as the experience and life history of employees [15].

2.4 Metode Hungarian

The Hungarian method is a method of modifying the rows and columns in the effectiveness matrix until a single zero component appears in each row or column that can be selected as an assignment allocation. In the business world management often faces problems related to optimal assignment until it arises from a variety of productive sources or personnel who have different levels of efficiency for different tasks. All assignment

allocations made are optimal allocations and when applied to the initial effectiveness matrix, will give the minimum assignment result[16].

To calculate the Hungarian method, here are the steps:

- c. Reduce each row of the matrix element by each of its smallest elements
- d. Reduce the result of the value of each matrix from step 1 by the element
- e. The optimization procedure involves drawing a minimum number of horizontal and or vertical lines to cover all 0 - valued elements
- f. Select the smallest element of the matrix
- g. Use this workforce on appropriate jobs to maximize profits [18].

RESULTS AND DISCUSSION

This research data was obtained through direct observation at the location by the researcher, as well as the results of an interview with a supervisor. In the cashier section, there is an employee named Manda who is a high school graduate with no previous work experience. She earns Rp1. 800,000 per month in this billiard business. Meanwhile, in the kitchen, there is Pandi, a SMK graduate majoring in Catering, who has one year of work experience in a restaurant and now earns a salary of Rp2,000,000 per month in the same place. In the bar section, Rini, who once worked in a coffee shop, now has experience in a billiard business and receives the same salary of Rp2,000,000 per month. For the supervisor position, Riki, a graduate from a public university with one year of experience at PT Valencia, earns a salary of Rp3,000,000 per month at the billiard business. After all the data was recorded, it was identified that there was an imbalance in the assignment between the employees, the tasks performed, and the salary given. To solve this assignment problem, the appropriate method is the Hungarian Method, which has been proven effective in improving the cost efficiency of convection both in the company and for business people [17].

There are about 4 employees in Gemoy Billiard and Coffee Shop business, and each employee has only one task at a time and has different responsibilities. Based on the facts about income and expenses below, it is important for each employee to observe their own behavior to maximize profits [19]. The data that has been obtained is as follows:

Table 1. Employee Data at the Gemoy Billiard and Coffee Shop Business

Employee / duties	Cashier	Kitchen	Bar	SPV
Manda	Rp.14.400	Rp.14.160	Rp.13.920	Rp.13.600
Riki	RP.23.760	Rp.23.600	Rp.23.440	Rp.24.000
Pandi	Rp.15.760	Rp.16.000	Rp.15.360	Rp.15.600
Rini	Rp.15.680	Rp.15.040	Rp.16.000	Rp.15.440

Where the above results are obtained through the calculation of the formula, $Labor\ Cost = \frac{Working\ Time \times SALARY}{1000}$

Since the Hungarian method requires one-to-one assignments, there are four possible assignments that can be made. Here are the solution steps that can be followed:

Table 2. Transition from Cost Matrix to Opportunity Cost Matrix

Employee / duties	Cashier	Kitchen	Bar	SPV
Manda	800	560	320	0
Riki	320	160	0	560
Pandi	400	700	0	240
Rini	640	0	960	400

The table above shows the transition from a cost matrix to an opportunity cost matrix. This process is done by selecting the smallest value from each row in the initial cost matrix, which is then used to subtract all the least values in that row.

Table 3. Effectiveness Matrix

Employee / duties	Cashier	Kitchen	Bar	SPV
Manda	480	560	320	0
Riki	0	160	0	320

Pandi	80	700	0	0
Rini	320	0	960	160

To find an implementation plan with a total opportunity cost of zero, there must be four “independent zeros” in the matrix. This means that each employee can only be assigned one task with no opportunity cost, or each task can only be performed by one employee.

Table 4. Total-Loss-Opportunity Matrix

Employee / duties	Cashier	Kitchen	Bar	SPV
Manda	400	400	320	0
Riki	0	0	0	320
Pandi	0	540	0	0
Rini	240	0	960	160

A practical procedure for performing optimization testing involves drawing a minimum number of horizontal and/or vertical lines, with the aim of covering all zero-valued elements in the total-oppt-cost matrix.

The Assignment Schedule for gemoy pool balls and coffee shop can be seen in the table below:

Table 5. Assignment Schedule for Gemoy Pool Ball and Coffee Shop

J1 – M4	Rp. 13.600
J2 – M1	Rp.23.760
J3 – M3	Rp. 15. 360
J4 – M2	Rp. 15.040
TOTAL	Rp. 67.760

In addition to the matrix calculation method done manually, the assignment problem can also be solved with a computer program. The POM-QM for Windows program is intended to handle quantitative management problems in operations and production. The data generated from the matrix method should be matched with the results from this program to ensure accurate calculations. This application has an easy-to-use interface that is very helpful in decision making, especially in determining the best production combination to maximize profits.

POM-QM is developed only to manage calculations, so users of this software are expected to be able to interpret problems and linear programming theory.

The following are the steps to use POM-QM software in the assignment case.

- Open the POM-QM application for Windows
- When the module tree appears, select Assignment
- Click file then newd
- The table will be displayed automatically. Complete the table starting with the title, number of jobs, and number of machines. There are two options for targets: maximize and minimize. Please choose according to your needs.
- Enter your data in the table, select the desired method then click solve [20].

The following are the results of data processing using the operation of the POM-QM computer program:

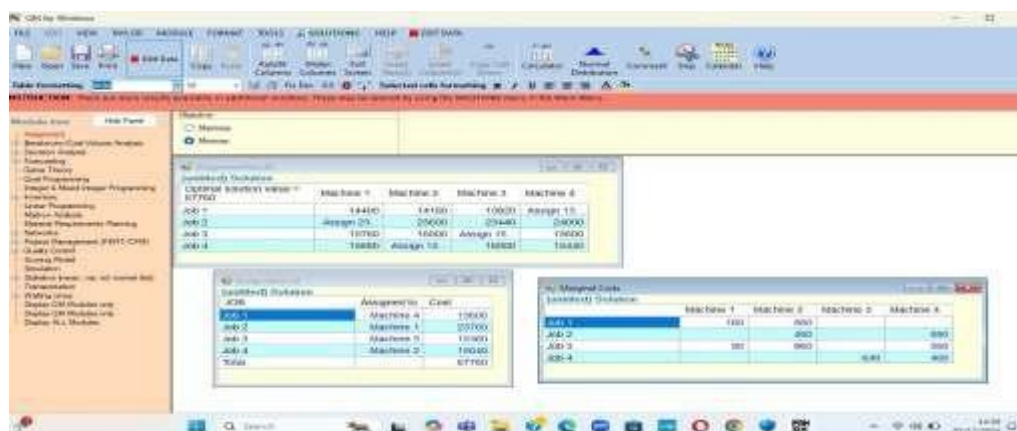


Figure 1. Results of Data Processing Using the Operation of the POM-QM Computer Program

The picture is the result of using the POM-QM application. Then the results of the calculation will be compared with manual calculations via the POM QM application to find out whether the results remain the same or not. The second calculation of the problem analysis of work productivity assignment using the Hungarian method in the business must be the same as using the POM QM application then the assignment problem can be declared complete.

Based on the analysis conducted using two data processing methods, namely manual processing and the POM-QM for Windows computer program, we can draw the following conclusions: Employee J1 is responsible for job M1 (Cashier), Employee J2 manages job M4 (SPV), Employee J3 handles job M2 (Kitchen), and Employee J4 does job M3 (Bar). This finding shows that both data processing methods, both manually and with POM-QM for Windows, produce identical outputs. Therefore, it can be concluded that the manual calculation that has been done is accurate... (Ni Made Dwi Arya, Mindhayani, and Science and Technology 2021). The multicollinearity test shows a tolerance value > 0.1 and a VIF (Variance Inflation Factors) value < 10 , meaning there is no multicollinearity.

4. CONCLUSION

From the assignment problem about the placement of job type ability at the company "Gemoy Billiard And Coffee Shop", the problem is how the desired business can determine the maximum judgment to place four employees into the most suitable position. After analysis and discussion, it can be concluded that the work in the company is based on the ability and ability of employees based on previous training. Tasks are also divided by position or division. After the Hungarian method calculation is completed, the company can optimize the employee's ability level according to the job's ability level value.

References

- [1] Mardiani, Sari, Novita, Fanani, and Afandhi, "Penerapan Metode Hungarian dalam Optimasi Penugasan Karyawan CV. Paksi Teladan," *Bull. Appl. Ind. Eng. Theory*, vol. 1, no. 1, pp. 1–3, 2020.
- [2] M. Ni Made Dwi Arya, I. Mindhayani, and F. Sains dan Teknologi, "Penempatan Karyawan Dapur Yang Optimal Untuk Meningkatkan Produktivitas Dengan Menggunakan Metode Hungarian," *J. Rekayasa Ind.*, vol. 3, no. 2, pp. 99–109, 2021.
- [3] J. Simatupang, "Teknik Penugasan Karyawan Vhida Ponsel dalam Penjualan Kartu Paket Internet Dengan Menggunakan Metode Hungarian," *Bull. Inf. Technol.*, vol. 2, no. 1, pp. 1–12, 2021, [Online]. Available: <https://journal.fkpt.org/index.php/BIT/article/view/47>
- [4] B. Prasetyo and A. M. Lubis, "Penyelesaian Masalah Penugasan pada Drafter Menggunakan Metode Hungarian dan Aplikasi POM-QM," *Bull. Appl. Ind. Eng. Theory*, vol. 1, no. 1, pp. 21–27, 2020.
- [5] N. Laurencia, "Metode Assigment Model Terhadap Kemampuan Kinerja Karyawan," *J. Manag. Innov. Entrep.*, vol. 1, no. 2, pp. 133–138, 2024, doi: 10.59407/jmie.v1i2.297.
- [6] Sukatin, Nurkhalipah, A. Kurnia, D. Ramadani, and Fatimah, "Humantech Jurnal Ilmiah Multi Disiplin Indonesia," *J. Ilm. Multi Disiplin Indones.*, vol. 1, no. 9, pp. 1278–1285, 2022.
- [7] S. R. Fitriatien and N. Mutianingsih, "Peningkatan Kemampuan Belajar Mandiri pada Mata Kuliah Operasional Riset melalui Self-Regulated Learning," *Mosharafa J. Pendidik. Mat.*, vol. 9, no. 1, pp. 95–106, 2020, doi: 10.31980/mosharafa.v9i1.595.
- [8] S. B. AINI, A. P. Z, A. ANNISA, Q. P. SUCI, and A. A. TANJUNG, "Optimasi Biaya Transportasi Pengiriman Air Minum Kemasan Pada Pt Tirta Sari Sumber Murni," *J. Manag. Innov. Entrep.*, vol. 1, no. 2, pp. 54–61, 2024, doi: 10.59407/jmie.v1i2.304.
- [9] A. R. Y. B. Tarigan1, B. B. Sembiring2, I. A. Pardede3, and A. A. Tanjung4, "SENTRI : Jurnal Riset Ilmiah," *SENTRI J. Ris. Ilm.*, vol. 2, no. 4, pp. 1275–1289, 2023.
- [10] H. Priyatno and G. Syam, "Analisa Dan Kinerja Jaringan Kabel Backbone Fiber Optic Link Primary Dan Redundant Gatot Subroto - Bandung Selatan Pt. Xyz," *Jorapi*, vol. 2, no. 2, pp. 1492–1496, 2024.
- [11] Sofwatillah, Risnita, M. S. Jailani, and D. A. Saksitha, "Teknik Analisis Data Kuantitatif dan Kualitatif dalam Penelitian Ilmiah," *J. Genta Mulia*, vol. 15, no. 2, pp. 79–91, 2024.
- [12] M. F. Fakhruddin, Wahyudin, and Hamdani, "Optimalisasi Penugasan Tidak Seimbang Menggunakan Metode Hungarian Pada Proses Pembuatan Glasswood (Studi Kasus : CV.Master Studio)," *J. Ilm. Wahana Pendidik.*, vol. 8, no. 13, pp. 317–325, 2022, [Online]. Available: <https://doi.org/10.5281/zenodo.6962489>
- [13] E. Fortuna, A. Rahman, and I. Pendahuluan, "Jurnal Optimasi Teknik Industri Analisis Optimasi Penugasan Operator Laboratorium Pengujian dalam Meningkatkan Produktivitas Kerja dengan Menggunakan Metode Hungarian," pp. 93–100, 2024.
- [14] Sugiyono, "Metode Dan Tehnik Penelitian," *J. Chem. Inf. Model.*, vol. 53, no. 9, pp. 1689–1699, 2024.
- [15] W. R. Nabila, D. Herwanto, and W. R. Zahra, "Optimalisasi Waktu Kerja Karyawan Menggunakan Metode Hungarian (Studi Kasus CV Bintang Jaya)," *STRING (Satuan Tulisan Ris. dan Inov. Teknol.*, vol. 7, no. 1,

- p. 66, 2022, doi: 10.30998/string.v7i1.13185.
- [16] A. A. Tuadi, A. Sahari, Andri, D. Lusiyantri, and M. Fajri, "Optimasi Penugasan Menggunakan Metode Hungarian Pada UD. Tiga Baudara," *J. Ilm. Mat. Dan Terap.*, vol. 19, no. 2, pp. 243–253, 2022, doi: 10.22487/2540766x.2022.v19.i2.15881.
 - [17] H. C. Chrisnathaniel, S. Hartini, and S. P. Rahayu, "Jurnal Nusantara Aplikasi Manajemen Bisnis Jurnal Nusantara Aplikasi Manajemen Bisnis," *Anal. Determ. Loyal. Pengunjung Di Perpust. Kota X*, vol. 5, no. 2, pp. 256–264, 2020.
 - [18] N. I. Royanti, P. Studi, T. Informatika, M. Informatika, S. Informasi, and S. W. Pratama, "OPTIMASI PENUGASAN MENGGUNAKAN METODE HUNGARIAN," vol. XVI, no. 2, pp. 18–21, 2021.
 - [19] D. Priya and G. Ramesh, "The Hungarian Method for the Assignment Problem, with Generalized Interval Arithmetic and Its Applications," *J. Phys. Conf. Ser.*, vol. 1377, no. 1, 2019, doi: 10.1088/1742-6596/1377/1/012046.
 - [20] M. Kurnia and A. Suseno, "Optimasi Penugasan Menggunakan Metode Hungarian Pada UMKM XYZ, Riau," *JURMATIS (Jurnal Manaj. Teknol. dan Tek. Ind.)*, vol. 3, no. 2, p. 103, 2021, doi: 10.30737/jurmatis.v3i2.1711.