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Shift Scheduling with the Goal Programming Approach in Fast-Food Restaurant: McDonald's in Kelantan

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HIGHLIGHTS

- Shift work schedules in a company are generally challenging, especially for the head manager to create a fair workforce schedule.
- It is essential to identify the most effective and appropriate method for equitable employee allocation and organizational effectiveness.
- The LINGO software creates a schedule using the 0-1 goal programming model approach.
- Each worker will be operating according to the pattern of each schedule.

ABSTRACT

A major fast-food restaurant chain, such as McDonald's, must perform well to maintain its credibility with customers and dominance over other competitors. A fair and balanced shift schedule of workers must be generated to ensure that the workers provide the best service and production for the restaurant. Consequently, this study proposed a fair and efficient workforce schedule at a McDonald's restaurant in Kelantan, Malaysia. Furthermore, the goal programming method and the LINGO software are used in this study to develop the best schedule for the workers over a 28-day period. Five hard constraints and three soft constraints are identified. The primary goal of this study, which demanded the same total workload for each worker, was met. However, the other two goals are not fully achieved but have little impact on the workers due to the 18-hour operation and rotation of schedules among workers. Finally, the generated schedule pattern has been shown to provide a better schedule in terms of having the same total number of shifts for each worker and giving each worker the same total number of off days.

Keywords: *Goal programming, LINGO software, Cyclic schedule, Optimization, Fast-food.*

INTRODUCTION

Shift work is a type of employment performance that refers to how a member of staff performs their duties, completes required tasks, and acts in the organization in which the workforce is required to provide services for a set period of time, which can be 24 hours a day, seven days a week. An operating company's shift is typically divided into three shifts with all employees rotating through their assigned shifts according to a schedule. Scheduling is one of the most important aspects of any organization or business, as it is the process of arranging, allocating, and controlling workloads in any workplace. A good and equitable workforce shift scheduling will result in better workload coordination. For example,to maximize profits and maintain high production quality, a large fast-food chain such as McDonald's must operate at least 18 hours per day. As a result, they require a large number of workers working in multiple shifts. McDonald's managers must also reduce the number of consecutive night shifts. As a consequence, the manual techniques used by McDonald's management will have a long-term impact on organizational performance and worker well-being.

Many studies have been conducted by other researchers to solve scheduling problems by using the relevant methods. An example of solving scheduling problems was using a stochastic approach, addressed by Molina-Pariente et al. (2016) to assign intervention dates and operating space to waiting list activities, to reduce the expense of operating rooms' under and overtime and to meet network capacity restrictions. Moreover, Mathlouthi et al. (2017) had used mixed-integer linear programming to solve a multi-attribute technician routing and scheduling problem motivated by a requirement for electronic transaction equipment maintenance and repair. In 1961, Charnes and Cooper created goal programming which is an extension of linear programming. Dalvand & Zamanifar (2019) conducted a study on a trade-off between delay and cost for multi-objective service provisioning in a fog by using goal programming. Besides, project selection and task prioritization are designed as classical optimization problems as shown by Del Caro Daher et al. (2019) and goal programming is one of the most widely used techniques for solving this kind of problem. Besides that, in the field of accounting, Popli & Popli (2019) studied Capital Budgeting Financial Reform. The goal programming model had been proposed for the allocation of project management time and costs by using the case in the building firm project.

Nevertheless, many studies have been conducted on scheduling problems using goal programming as an appropriate method to solve the problems. Rashid et al. (2018) used a goal programming approach to generate toll gate workers cyclical scheduling for every thirty days and has been applied in all scheduling toll systems in Malaysia. Meanwhile, Cappanera, Visintin & Banditori (2016) conducted a study on the master surgical scheduling (MSS) problem by using integer programming and goal programming approach to support the process. From the study, it was proven that the models showed a reasonable trade-off considering the stated objectives. Besides, goal programming method has been used by Kaçmaz, Alakaş, & Eren (2019) to solve scheduling problems in the glass industry among 80 personnel in Ankara.

According to the discussion, scheduling problems can be solved using various methods if the issues of scheduling and planning are considered. Therefore, it is important to identify the most effective and appropriate method for equal and fair employee allocation and organizational success. As a result, this research aims to propose a goal programming method as one of the reasonable methods for solving scheduling problems.

METHODOLOGY

Method of Data Collection

The information gathered in this study is the 18-hours worker shift schedule running fast-food restaurant where the primary data was collected at a McDonald's restaurant based in Kok Lanas, Kelantan. The data consists of the number of shifts, the number of workers allocated to each shift and the length of a shift. The McDonald's restaurant studied has a total of 56 workers working a month with two shifts which are morning and evening shifts.

Development of Suggested Schedule

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This study, however, suggests that the new schedule must have three shifts which cover the morning shift, evening shift and night shift in order to get the best solution result whereby each shift is made up of six hours of working. Furthermore, this study has divided the workers into two groups where each group has 28 workers respectively and takes 28 days per schedule. Only one group of workers' data is taken to run in the LINGO software. Then, the first group's schedule pattern will be implemented to the other group. The schedule pattern is divided into two groups because the more workers involved in the schedule generation, the more constraints that must be created, and because the software has minimal limits, it will generate an error while running the software. Under goal programming, LINGO software was used to generate a more equitable and improved shift schedule.

Hard Constraints

Hard constraints are based on McDonald's policies and must be met. This outlet imposes five hard constraints. The first constraint is ensuring that the minimum worker level requirement is met for each shift (morning, evening, and night). The second constraint is that each employee can only be assigned to one type of shift per day. The next constraint is that each worker must work three consecutive days of night shifts, followed by two days off. The fourth constraint is that each worker must work no more than six consecutive days, and the final constraint is to ensure that each worker must work between 20 and 22 days per week.

Soft Constraints and Binary Constraints

Soft constraints that specifically aim to meet worker satisfaction can be considered Goals. Morning, evening, night, and day off shifts are represented by $A_{i,k}$, $B_{i,k}$, $C_{i,k}$ and $D_{i,k}$ respectively. The goal and constraint deviations were defined as follows:

- ρ : Positive Deviation
- η : Negative Deviation

Soft constraint 1: A worker who has work in an evening shift must not work a night shift on the next day.

For the first 27 days, 28 workers (in the following equation 1, "i" will take up to a maximum of 27):

$$B_{i,k} + C_{i+1,k} + \eta 1_{i,k} - \rho 1_{i,k} = 1,\ i = 1,2,\ldots,n-1\ and\ k = 1,2,\ldots,m \quad (1)$$

27 workers for the 28th and 1st days (in the following equation 2, "k" will take a maximum value of 27):

$$B_{n,k} + C_{1,k+1} + \eta 1_{n,k} - \rho 1_{n,k} = 1,\ k = 1,2,..,m-1 \quad (2)$$

28 workers and 1st workers for the 28th and 1st:

$$B_{n,m} + C_{1,1} + \eta 1_{n,m} - \rho 1_{n,m} = 1 \quad (3)$$

Soft constraint 2: A worker who has work in a night shift must not work a morning shift the next day.

For the first 27 days, 28 workers (in the following equation 4, "i" will take up to a maximum of 27 values):

$$C_{i,k} + A_{i+1,k} + \eta 2_{i,k} - \rho 2_{i,k} = 1,\ i = 1,2,\ldots,n-1\ and\ k = 1,2,\ldots,m \quad (4)$$

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27 workers for the 28th and 1st days (in the following equation 5, "k" will take a maximum value of 27):

$$C_{n,k} + A_{1,k+1} + \eta 2_{n,k} - \rho 2_{n,k} = 1,\ k = 1,2,..,m-1 \quad (5)$$

28 workers and 1st workers for the 28th and 1st day:

$$C_{n,m} + A_{1,1} + \eta 2_{n,m} - \rho 2_{n,m} = 1 \quad (6)$$

Soft constraint 3: Each worker carries the same total workload.

Hard constraint 5 stated that a worker must work between 20 to 22 days per schedule, but workers desire to have the same workload. Thus, each worker will have 21 shifts in the business.

$$\sum_{i=1}^{n} (A_{i,k} + B_{i,k} + C_{i,k}) + \eta 3_k - \rho 3_k = 21,\ k = 1,2,\ldots,m \quad (7)$$

Binary Constraints: For each shift (morning, evening, night) and for each worker, the value can be 0 or 1.

A = 0 or 1; B = 0 or 1; C=0 or 1; D = 0 or 1; (8)

Goals

The goal is created based on a list of soft constraints to determine whether or not each goal will be achieved. The goals are identified to minimize the equation, as shown below:

Goal 1: Minimize $\sum_{i=1}^{n} \sum_{k=1}^{m} \rho 1_{i,k}$ (9)

Goal 2: Minimize $\sum_{i=1}^{n} \sum_{k=1}^{m} \rho 2_{i,k}$ (10)

Goal 3: Minimize $\sum_{k=1}^{m} (\eta 3_k + \rho 3_k)$ (11)

Priority of each goal

Pre-emptive goal programming explains that objectives and constraints are stated at different priorities. The optimization problem will be solved at each priority either to minimize or maximize the specified objective at that priority. If there are constraints in the priority, the satisfaction of the constraints needs to be maximized. In other words, the problems of the study can be solved according to the priorities ordering of goals. The pre-emptive goal programming model can be obtained after formulating a model subject to hard constraints, soft constraints, binary constraints, and non-negativity constraints. In this model, pre-emptive goal programming is to minimize the following equation:

$$\left(\sum_{i=1}^{n} \sum_{k=1}^{m} \rho 1_{i,k},\ \sum_{i=1}^{n} \sum_{k=1}^{m} \rho 2_{i,k},\ \sum_{k=1}^{m} (\eta 3_k + \rho 3_k)\right) \quad (12)$$

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FINDINGS AND DISCUSSION

The results of 28 days of shift work patterns and days off is shown in Table 1, where the optimal solutions were generated by LINGO software. **Goal 1** which stated a worker who has work in an evening shift must not work a night shift on the next day is achieved by some workers. There are 9 schedule patterns shown in Table 1 which have night shifts on the next day if worked in evening shift on the current day which are L4, L21, L22, L23, L24, L25, L26, L27, L28. This shows that the schedule has not fully satisfied **goal 1**. For **goal 2**, a worker who has worked in a night shift must not work in a morning shift the next day. Based on the results obtained in Table 1 above, the schedule shows that each schedule patterns do not have morning shift the next day if they worked the night shift except for L3 and L20. This indicates that the schedule is 7.14% not satisfying **goal 2** where 2 out of 28 schedule patterns did not satisfy the goal. Despite that, this result does give a huge effect on the workers' preference since the schedule is developed for 18-hours schedule and not 24-hours where the workers can still have an adequate rest of approximately 6 hours before they start a new shift the next day.

Table 1: Schedule Pattern Using 0-1 Goal Programming Model

	SCHEDULE PATTERN																											
DAY	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28
1	N	N	N	N	M			E	E	M	M	E	N	N	M	N	N	M	N	E	E	N	E	M	M	N	M	N
2	N	N	N	N	M	E	E	M	M							E	N	M	E	E			M		N	E		
3	N	N	N	N					E		E	N	E	N	M	E	N	M	M	M	E	E	E	E	N	E	E	N
4					N	N	N		E		E		M	N	N	M	N	N		M	M	E	M	M	E	M	E	E
5					N	N	N		M	E			E		E		E	E	E	M	M	M	E	M	M		M	E
6	M			M	N	N	N							M	E			E				M		E	E			E
7	E	M	M	E				N	N	N		M		E												E		M
8	E	M	M					N	N	N	E	E							M		E					M		
9	M	M	E		M			N	N	N						E			E	E	M							
10					E	M	M				N	N	N	E	E	M	E				M	M	E					
11					M	M	E				N	N	N	M	E	M	E	N	E	E		M	M	M	N		E	
12			E	E		N	E	M	E	M	N	N	N				M	N	M	E	E	N	M	E	N	N	M	N
13					E	E	M	M	M	E				N	N	N								M			E	
14		E		N	E	E	N							N	N	N	E	M	N	M	E	N	E	M	E	M	E	M
15	N	E	N	E	M	E	E	E		E	E	M	M	N	N	N	M	N	N	N	M	E	E	N	E	E	M	N
16	E	E	M	M	E		M	M	E	M	M	E	E				N	N	N	M	E	M	E	E	M	E	M	E
17	M	M	E	E	M	E	E	E	M	M	M	E	E				N	N	N	M	E	E	M	E	E	M	M	M
18	E	M	M	M		M		E	E	E	M	E	E	E	E	M	N	N	N	M	E	E	M	M	M	E	E	E
19	M	E	E	E				E	E	M	M	M	E	M	E	M				N	N	N	M	M	M	E	E	M
20	M	M	E	M		E	E	M		M	E	M	M	E	E	M				N	N	N	E	E	E	E	E	M
21	M	E	M	E	M	M	E	M	E	E	M	E	E	E	E	M	M	E	M	N	N	N	M	E	M	E	M	E
22	M	E	M	E	M	E	E	E		E	E	E	E	E	E	M	E	E	M				N	N	N	M	E	E
23	M	E	E	E	M	E	M	E	M	M	M	E	E	M	E	E	E	M	M				N	N	N	M	E	M
24	M	M	E	M	M	M	M	M	E	M	E	E	M	M	M	M	E	E	E	M	E	M	N	N	N	E	E	E
25	M	E	E	E	M	E	E	E	E	E	M	E	E	E	M	E	E	E	M	E	E	E				N	N	N
26	M	M	E	E	M	E	E	M	E	E	E	E	M	E	E	M	E	E	E	E	E	M				N	N	N
27	M	E	E	E	E	E	E	E	M	E	E	M	M	E	E	E	E	E	E	E	E	M	E	E	E	N	N	N
28	M	M	E	N	M	E	M	E	M	E	M	M	E	M	E	E	M	E	E	E	E	E	N	M	N			

M= Morning Shift , N= Night, E= Evening Shift, 0= Days Off

Hard constraint 2 is satisfied where there are no workers in each schedule pattern in Table 1 who work more than one shift in a day. Referring to hard constraint 3, each worker needs to work 3 straight days of night shifts followed by 2 days off and is satisfied except for L28. However, each schedule pattern has the

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same number of off days in a schedule. This schedule will create a sense of satisfaction among the workers. Moreover, hard constraint 4 is not satisfied since each schedule pattern has more than six consecutive days. For hard constraints 1, the minimum workers required for each shift are fully achieved since it shows each schedule pattern achieved the minimum number of workers required for all three shifts.

Table 2: Summary of Number of Shifts and Number of Days Off for Each Worker

WORKERS	TOTAL MORNING SHIFTS	TOTAL EVENING SHIFTS	TOTAL NIGHT SHIFT	TOTAL DAYS OFF	TOTAL NUMBER OF SHIFTS
1	13	4	4	7	21
2	9	9	3	7	21
3	6	11	4	7	21
4	5	11	5	7	21
5	13	5	3	7	21
6	5	12	4	7	21
7	6	11	4	7	21
8	8	10	3	7	21
9	7	11	3	7	21
10	8	10	3	7	21
11	9	9	3	7	21
12	6	11	4	7	21
13	6	11	4	7	21
14	6	9	6	7	21
15	4	13	4	7	21
16	10	7	4	7	21
17	4	10	7	7	21
18	5	9	7	7	21
19	7	8	6	7	21
20	8	9	4	7	21
21	5	13	3	7	21
22	8	7	6	7	21
23	8	9	4	7	21
24	9	8	4	7	21
25	6	7	8	7	21
26	6	10	5	7	21
27	7	11	3	7	21
28	6	8	7	7	21

Based on Table 2, the generated schedule shows that all workers have the same number of shifts and number of days off. This shows that **goal 3** is satisfied where each worker must carry the same total workload. Subsequently, hard constraint 5 which stated earlier that a worker must work between 20 to 22 days per schedule is also achieved.

Some differences exist between the schedule of workers and the schedule of the 0-1 goal programming method for the total number of working days within 28 days. For the manual schedule, the number of working days per worker is not balanced because some of the workers work 13 days per schedule while some of the workers work 11 per schedule. This irregular schedule has caused dissatisfaction among those workers because some of the workers have exceeded the maximum working days. By using 0-1 goal programming model, the schedule results in workers having the same number of working days per schedule and all workers did not exceed the maximum number of working days, which is much more balanced compared to the manual schedule. It gives workers a significant sense of satisfaction since the allocation of working days between workers is equal. This would lead to workers being more content and willingly doing their jobs at a higher level of quality.

Cyclical Schedule

The head manager of McDonald's restaurant will assign each worker according to the cyclic schedule pattern as shown in Table 3 below.

Table 3: The Cyclic Schedule's Pattern for Each Worker

SCHEDULE	WORKER																											
(WEEK)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1 (1-4)	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28
2 (5-8)	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1
3 (9-12)	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2
4 (13-16)	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3
5 (17-20)	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4
6 (21-24)	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5
7 (25-28)	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6
8 (29-32)	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7
9 (33-36)	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8
10 (37-40)	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9
11 (41-44)	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
12 (45-48)	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11
13 (49-52)	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12
14 (53-56)	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13
15 (57-60)	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14
16 (61-64)	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15
17 (65-68)	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16
18 (69-72)	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17
19 (73-76)	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18
20 (77-80)	L20	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19
21 (81-84)	L21	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
22 (85-88)	L22	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21
23 (89-92)	L23	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22
24 (93-96)	L24	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23
25 (97-100)	L25	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24
26 (101-104)	L26	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25
27 (105-108)	L27	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26
28 (109-112)	L28	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27

The routine among the workers will be rotated and each worker at the end of week 112 (28 schedules) will operate according to the pattern of each schedule. Then, after completing 28 schedules, each worker will review the starting schedule. Factors of completeness and consistency are fulfilled by the schedule. While the fairness aspect is allocated, the pattern of the schedule will be rotated among the workers. All workers will be able to work with the trends of the satisfactory and less satisfactory schedules.

Although certain patterns seem less satisfactory for workers, each of them will have to meet all schedule patterns. For example, in the previous Table 1, the schedule pattern indicates that L3 and L20 would have morning shifts right after the night shifts while other patterns do not have morning shifts if the previous day works on night shifts. The generated schedule pattern in Table 1 and cyclic schedule in Table 3 will also be applied to the other group which is the other half of the 28 McDonald's employees. This means that Worker 29 will follow the same schedule pattern and cyclic schedule as Worker 1. Meanwhile, Worker 30, Worker 31, Worker 32 until Worker 56 will also follow the same schedule pattern and cyclic schedule as Worker 2, Worker 3, Worker 4 and so on until Worker 28 similar to the first group. Both groups will thus have the same schedule pattern and will be rotated equally among the workers until the end of week 112 (28 schedules).

Since the LINGO result provides the optimization of workers in shift allocations as shown in Table 1, the objective of the study has therefore been successfully achieved. This explains why 0-1 goal programming method allows workers to get the optimization total working days over the schedule (28 days). However, some constraints have not been satisfied using LINGO software with 0-1 goal programming approach. Following that are a few suggestions for improving the study's efficiency.

CONCLUSION AND RECOMMENDATIONS

In this study, the schedule of McDonald's Restaurant was created to solve the scheduling problem. The technique provides an optimal solution that meets the company's requirements as well as the workers' preferences. The objective function is to create a fair and balanced schedule by producing the same number of working days for each worker using the GP approach in McDonald's branch in Kelantan. It allows the workers to work consistently and to know their schedule ahead of time. The other objective is to achieve optimization in the allocation of workers in each shift by stating the minimum requirement of workers for each shift. Both of these targets were accomplished successfully. The workers' schedule is currently handled manually which is exhaustive and requires a lot of time. The workers' schedule is more systematic and less time-intensive with the use of Goal Programming.

The final purpose is to build a full scheduling structure that can be used in the planning of monthly scheduling by the restaurant's manager. Since Goal Programming is a powerful and interactive tool, it is effective in solving complex problems such as multi-objective problems and also improves decision-making effectiveness. It is highly recommended by experts and decision-makers to deal with the complexities of the schedule of other companies or companies' decision-making issues. To address scheduling issues, there are other versions of Goal Programming methods such as Fuzzy Goal Programming, Interval Goal Programming, Duality Solution and Fractional Goal Programming. Therefore, the findings obtained should be compared with other Goal Programming techniques for further analysis in order to assess the effectiveness and accuracy of the results.

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CONFLICT OF INTEREST DISCLOSURE

All authors declare that they have no conflicts of interest to disclose.

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