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Goal Programming Approach for Service Staff Scheduling Problem in A Restaurant

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Abstract

Personnel scheduling plays a crucial role in the service industry, particularly in labor-intensive businesses like restaurants. The effective allocation of shifts for employees is essential to ensure uninterrupted service and optimize profitability. Poor scheduling can negatively impact both the business and its employees, resulting in decreased profitability and increased physical and mental strain. Continuity of service is essential in restaurant businesses. Shift plans ensure that the service continues uninterrupted by assigning personnel to various shifts. In order to provide the best service in restaurants, the daily shifts of the personnel working in shifts should be planned systematically. In this study, it is aimed to create the shift schedules of the service personnel in the Eskişehir branch of one of the leading restaurants in Turkey. The restaurant employs two types of service personnel: busboys and waiters. The number of required personnel varies across different days and shift periods. In this context, personnel shift schedules were created by using the goal programming method in the study, taking into account the business objectives, personnel needs and shift characteristics. The results of this study can contribute to the literature on staff scheduling in restaurants and can help restaurant businesses create more effective schedules.

Key Words

"Goal programming, personnel scheduling, shift scheduling, restaurant management, human resources management"

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1.Introduction

As labour-intensive service industries, restaurants require careful workforce planning to ensure optimal staffing levels (Bolayir & Ergülen, 2022). Inaccurate personnel allocation and shift arrangements can lead to decreased profitability and increased mental burden on employees. Although working for long hours in the hotel, restaurant and service sectors can be seen as cost savings, it can negatively affect employee performance and overall service quality (Çalişkan & Ünüsan, 2011). Service continuity is vital, particularly in tourism, restaurant and hotel businesses. Scheduling is a method that aims to allocate or distribute remaining resources or equipment to carry out a task within a given time frame (Laga & Sarno, 2018). Staff scheduling is the process of creating work schedules for staff so that an organization can meet the demand for its goods or services (Bolayır & Ergülen, 2022). Shift schedules enable personnel to be assigned to different shifts, ensuring uninterrupted service delivery (Aksoy et al., 2021). Therefore, it is essential to systematically plan daily shifts for personnel to optimize service provision in restaurant establishments. Personnel scheduling involves determining when employees will work based on their needs, preferences, and various limitations while aligning with business objectives. It is crucial for meeting workforce requirements effectively (Supciller & Erbilek, 2021).

Staff scheduling problems are significant challenges in both production and service sectors. In shift scheduling, employees are assigned to specific positions on particular days and hours. This process requires considering technical and legal constraints, employee preferences and needs, and various enterprise-specific constraints while aiming for balanced and fair assignments (Supciller & Erbilek, 2021). Optimization models can help overcome these problems in the creation of staff schedules. Previous studies on personnel scheduling frequently employ methods such as integer programming (Ingolfsson et al., 2010; Nobil et al., 2022), multi-objective optimization (Wang et al., 2022), and various metaheuristics (Hao et al., 2004; Jafari & Salmasi, 2015). Goal programming is another optimization method that can be used for this purpose. This method was used in many studies on tourism (Ernst et al., 2004; Kassa and Tizazu, 2013; Davras, 2017), education (Ciritcioğlu et al., 2017; Supciller & Erbilek, 2021), and health industries (Bektur &Hasgül, 2013; Ciritcioğlu et al., 2017; Varli & Eren, 2017).

Effective personnel scheduling is crucial for optimizing workforce management in service industries, especially in restaurants. Businesses can create equitable and efficient schedules that ensure service continuity and enhance overall performance by considering various factors such as business objectives, employee preferences, and shift characteristics. Restaurant staff scheduling is considered one of the most difficult problems (Akhundov, Tahirov & Glock, 2022). The staff scheduling problem in a restaurant might be further complicated by such factors as: unexpected situations and sudden increases in demand; individual preferences, skill sets, working hours availability of staff; multiple shifts, leaves, holidays, and sick days and various roles of staff such as waiter, chef, busser, kitchen assistant, and cleaners. Goal programming is an efficient method for personnel scheduling problems because it is an analytical method in which the characteristics of the goals are certain, and the decision maker minimizes the part of the goals that cannot be achieved. Its main difference from other maximization or minimization problems is that multiple and conflicting objectives can be included in the objective function (Supciller & Erbilek, 2021). Although various linear programming models have been used in previous studies on restaurant staff scheduling (Choi, Hwang & Park, 2009; Akhundov et al., 2022; Ahamad & Ghani, 2023), studies using goal programming are still limited (Bektur and Hasgül, 2013; Nasir et al., 2022). There is a gap in the restaurant industry for the use of goal programming in staff scheduling.

Considering this gap in the literature, this study aims to schedule the shifts of service personnel in the Eskişehir branch of one of Turkey's leading restaurants by using goal programming. The restaurant employs two types of staff: bussers and waiters. Different numbers of bussers and waiters are required on different days and shift periods. The objective is to create personnel schedules that are as equitable and fair as possible. Goal programming was used, considering business objectives, and shift characteristics. This study is important for the restaurant industry as it offers new practical information and a mathematical model for staff scheduling. A literature review on the use of goal programming in staff scheduling is given in section two. The aim and formulation of goal programming are given in section three. The mathematical model, business rules and preferences and separate work schedules of bussers and waiters created as a result of model analysis are shown in section four. In section 5, research conclusions, suggestions and research limitations are mentioned.

2. Literature Review

Staff shift scheduling is essential in the healthcare sector. One of the goals of healthcare establishments is cost savings and improving service quality. When examining past studies in the literature, it is observed that nurse scheduling problems are frequently addressed. Varli & Eren (2017) proposed a goal programming model to meet the required number of nurses in intensive care, operating room, and emergency departments of a hospital. Similarly, Atmaca et al. (2012) used goal programming to create shift schedules for nurses in a hospital. Goal programming models for staff scheduling are also used in many fields outside the service sector (Varli & Eren, 2017). In some studies, goal programming has been integrated with multi-criteria decision-making methods such as AHP to create scheduling models (Supciller & Erbilek, 2021; Varli & Eren, 2017). In their study, Supciller & Erbilek (2021) aimed to address the staff scheduling problem in the education field, which is another important service sector. They determined the weekly shift schedule for part-time student workers in a university's central library. They used goal programming and the Analytic Hierarchy Process methods to make appropriate assignments to suitable days and shifts while considering the students' weekly class schedules. In another study, the working conditions of security guards with different job types in a university were considered from different perspectives, and shift assignments

were made using goal programming (Ciritcioğlu et al., 2017). When reviewing past studies, different methods have been used, taking into account the sector characteristics and constraints to create staff schedules in various fields such as tourism, healthcare, and education. Staff scheduling is of critical importance in the tourism sector. Tourism is a service sector, and the high short-term fluctuations in demand, the need for services to be available 24/7, and the inability to stockpile the workforce further increase the importance of workforce planning (Davras, 2017). Personnel costs are often one of a hotel's most significant expense items. Payroll and related expenses sometimes exceed 30% of hotel operating costs (Ernst et al., 2004). Kassa and Tizazu (2013) created weekly shift schedules for the engineering department personnel of a five-star hotel, taking into account their rest needs and the required number of personnel per shift using the integer programming method. Davras (2017) created shift schedules for receptionists in a five-star hotel using integer linear programming, considering the required daily and hourly personnel numbers, breaks, and managers' prioritized objectives. Bolayır and Ergülen (2022) aimed to make workforce planning considering the working constraints and staff salaries in the hotel. They found the optimal number of workers in the hotel's shifts by establishing a pure integer programming model. The tourism sector includes not only hotels and accommodation establishments but also transportation, food and beverage, and entertainment businesses. Various studies have been conducted in the aviation sector to create staff schedules. Metaheuristic methods such as ant colony optimization (Deng & Lin, 2011), genetic algorithms (Levine, 1996), and integer programming (AhmadBeygi et al., 2009) have been used for crew scheduling in the airline industry.

Restaurants are labour-intensive sectors within the food and beverage industry. When creating staff schedules in restaurant establishments, different constraints should be considered. Choi et al. (2009) used integer programming to balance full-time and part-time workers and create shift schedules, enabling the restaurant to maintain an appropriate service level and reduce overall labour costs. Ahamad and Ghani (2023), conducted a study in a fast-food restaurant. They developed a binary integer programming (BIP) model and aimed to minimize the number of staff working in a day and as a result of the study they created fair working schedules with a smaller number of staff. Akhundov et al. (2022), developed integer programming models. They considered some tasks and responsibilities, employee types and experience levels and differences in the complexity of customer orders. They reported that overstaffing levels and labour costs were reduced as a result of the optimization. In another study, Noor, Alwadood & Adnan (2022) used a mixed integer linear programming model at a fast-food restaurant in order to find the optimum working schedule. Few studies have used goal programming. Bektur and Hasgül (2013) created staff shift schedules using goal programming, considering the employees' skills, seniority levels, preferences, and the system's demands. Nasir et al. (2022) used goal programming to create a schedule and aimed to ensure a fair workload for each worker. As a result of their study, they stated that they provide the same total number of shifts for restaurant staff.

When the studies on staff scheduling in restaurants are examined, studies using goal programming are still limited. There is a significant gap in the literature on restaurant staff shift scheduling, and more work needs to be done in this area. The remainder of the article provides information about goal programming and continues with the application of goal programming to solve the staff scheduling problem in a restaurant.

3. Goal Programming

Goal programming aims to assist decision-makers in making choices that will satisfy conflicting goals as much as possible (Goh, 2019). There are some fundamental concepts that shape the structure of goal programming. These concepts include objective function, deviation variables, goals, and constraints. The objective function is a function that minimizes undesirable constraints in the objectives (Öztürk, 2009; Supciller & Erbilek, 2021).

Deviation variables represent the deviations from the goals and are included in the objective function of the model to indicate cases where the desired goal is exceeded or not achieved. Negative deviation variables indicate how much the goal is not achieved, while positive deviation variables indicate how much the goal is exceeded (Eroğlu, 2021).

Goal programming involves two types of constraints: system constraints and goal constraints. The goals that the decision-maker aims to achieve or considers necessary are translated into goal constraints in the model. Goal constraints are flexible and allow for deviations from the goals, unlike system constraints. System constraints do not allow any deviations (Eroğlu, 2021; Öztürk, 2009; Supciller & Erbilek, 2021).

3.1. Formulation of Goal Programming

In goal programming, the aim is to minimize deviation variables. Unlike linear optimization, the objective function is not directly maximized or minimized in goal programming. Objective Function is a function minimizing undesired deviations from the targets and shown in Equation (1) (Öztürk, 2009). Equation (2) represents the goal constraint. Equation (3) and Equation (4) include the deviation variables. In goal programming, the deviation variables symbolized as d_i^+ and d_i^- are tried to be minimized. The mathematical representation of goal programming is as follows (Supciller & Erbilek, 2021):

y_i : j. decision variable

k_{ij}: i. goal and j. decision variable coefficient

l_i : the desired value for i. goal

d_i^+: positive deviation variable
d_i^-: negative deviation variable

Minimize Z = $\sum_{i=1}^{k}(d_i^+ + d_i^-)$ (1)

$\sum_{j=1}^{n} k_{ij} y_i + d_i^+ + d_i^- = l_i$ (2)

$d_i^+ x\ d_i^- = 0$ (3)

$x_i, d_i^+, d_i^- \geq 0$ = 1,2…..,k j = 1,2…,n (4)

4. Application

In this section, a goal programming model has been created in order to obtain the most appropriate solution for the creation of the shift schedules of bussers and waiters in a restaurant business. Goal programming is classified as single-objective programming, equally-weighted/unweighted multi-objective programming, weighted multi-objective programming, priority multi-objective programming, and weighted-priority multi-objective programming according to the objectives of the problem (Öztürk, 2009; Supçiller ve Erbilek, 2021). In this research, an Equally Weighted/Unweighted approach was used in the establishment of the model, since the objectives of the research do not have any priority and the deviation variables are equally important. While creating the goal programming model, these stages of defining the problem were achieved: determining the parameters and decision variables, determining the system and goal constraints, and creating the goal function. The created model was solved with the GAMS v22.5 package program, and weekly shift schedules were created for the bussers and waiters, and the days when the staff would be off were determined.

4.1. Defining the Problem

The research was carried out in the Eskişehir branch of a restaurant business that has many branches in Turkey. Shift planning was done manually by the human resources assistant manager. In manual assignments, making a fair shift assignment for each staff member is both difficult and time-consuming. The shift assignments of the bussers and waiters are made according to the following conditions:

- A total of 12 bussers and 7 waiters works in the restaurant.
- Bussers cannot work as waiters or waiters cannot work as bussers.
- All personnel work in shifts in the morning (08:00 - 18:00), mid-day shifts (12:00 - 22:00) and at night (16:00 - 02:00).
- 1 waiter must be on duty in the morning shift.
- Minimum 2 and maximum 3 waiters should be on duty during the mid-day and night shifts.
- Minimum 2 and maximum 3 bussers should work in the morning shift.
- Minimum 3 and maximum 4 bussers should work in the mid-day shift.
- Minimum 3 and maximum 5 bussers should work in the night shift.
- All staff should be given one day off per week and staff should work 6 days a week.
- No staff should be off on the weekend.
- All staff should work on Fridays as much as possible.
- If a staff member is assigned to the night shift, they should not be assigned to the morning shift the next day.
- Each waiter on the morning shift can only be assigned one day per week.
- Appointments are requested to be made as equally and fairly as possible.

The minimum and maximum number of bussers and waiters to work in shifts is summarized in Table 1:

Table 1. Number of Bussers and Waiters to Work in Shifts

Bussers (12 Staff)	**Shift**	**Min – Max Number of Bussers**
Shift No: 1	Morning (08:00-18:00)	2 - 3 staff
Shift No: 2	Mid-day (12:00- 22:00)	3 - 4 staff
Shift No: 3	Night (18:00 - 02:00)	3 - 5 staff
Waiters (7 Staff)	**Shift**	**Min – Max Number of Waiters**
Shift No: 4	Morning (08:00-18:00)	1 staff
Shift No: 5	Mid-day (12:00- 22:00)	2 - 3 staff
Shift No: 6	Night (18:00 - 02:00)	2 - 3 staff

4.2. Parameters

n: total number of service personnel working in the restaurant = 19 *(Bussers: 1-12, Waiters:13-19)*
m: number of days = 7 *(1: Mon, 2: Tue, 3: Wed, 4: Thu, 5: Fri, 6: Sat, 7: Sun)*
t: total number of shifts of bussers and waiters = 6 *(**Bussers**: Shift 1: Morning, Shift 2: Mid-day, Shift 3: Night; **Waiters**: Shift 4: Morning, Shift 5: Mid-day, Shift 6: Night)*
i: Personnel index i = 1.2…..,n
j: Day index j = 1.2…..,m
k: Shift index k = 1,2,..,t

4.3. Decision Variable

$$x_{ijk=} \begin{cases} 1 \text{ i. staff is assigned on j. day to k. shift} \\ 0 \quad \text{otherwise} \end{cases}$$

4.4. Constraints

In this section, constraints for the busser and waiter staff are provided.

4.4.1. Constraints for bussers
1. Constraints on the maximum and minimum number of bussers to be assigned to each shift.

Required number of bussers for the morning shift

$\sum_{i=1}^{12} X_{ijk} \geq 2$ ∀j, k = 1 (5)

$\sum_{i=1}^{12} X_{ijk} \leq 3$ ∀j, k = 1 (6)

Required number of bussers for the mid-day shift

$\sum_{i=1}^{12} X_{ijk} \geq 3$ ∀j, k = 2 (7)

$\sum_{i=1}^{12} X_{ijk} \leq 4$ ∀j, k = 2 (8)

Required number of bussers for the night shift

$\sum_{i=1}^{12} X_{ijk} \geq 3$ ∀j, k = 3 (9)

$\sum_{i=1}^{12} X_{ijk} \leq 5$ ∀j, k = 3 (10)

2. Bussers should have one day off per week and work for six days,

$\sum_{j=1}^{g} \sum_{k=1}^{3} X_{ijk} = 6$ i = 1,2…,12 (11)

3. All bussers should be scheduled to work on weekends

$\sum_{i=1}^{n} \sum_{k=1}^{3} X_{ijk} = 12$ j = 6,7 (12)

4. Each busser should be assigned to only one of the daily shifts,

$\sum_{k=1}^{3} X_{ijk} \leq 1$ i = 1,2,…,12, ∀j (13)

5. If a busser is assigned to the night shift, he/she should not be assigned to the morning shift the following day,

$X_{ijk} + X_{i(j+1)(k-2)} \leq 1$ i = 1…12, j = 1,2…,6, k=3 (14)

4.4.2. Constraints for waiters
1. Constraints on the maximum and minimum number of waiters to be assigned to each shift.

Required number of waiters for the morning shift

$\sum_{i=13}^{n} X_{ijk} = 1$ ∀j, k = 4 (16)

Required number of waiters for the mid-day shift

$\sum_{i=13}^{n} X_{ijk} \geq 2$ ∀j, k = 5 (17)

$\sum_{i=13}^{n} X_{ijk} \leq 3$ ∀j, k = 5 (18)

Required number of waiters for the night shift

$\sum_{i=13}^{n} X_{ijk} \geq 2$ ∀j, k = 6 (19)

$\sum_{i=13}^{n} X_{ijk} \leq 3$ ∀j, k = 6 (20)

2. Each waiter should be assigned to the morning shift only once per week,

$\sum_{j=1}^{g} X_{ijk} \leq 1$ i = 13,1 4, ..., n, k = 4 (21)

3. Waiters should have one day off per week and work for six days,

$\sum_{j=1}^{g} \sum_{k=4}^{t} X_{ijk} = 6$ i = 13,14, …., n (22)

4. All waiters should be scheduled to work on weekends,

$\sum_{i=13}^{n} \sum_{k=4}^{t} X_{ijk} = 7$ j = 6,7 (23)

5. Each waiter should be assigned to only one of the daily shifts,

$\sum_{k=4}^{t} X_{ijk} \leq 1$ i = 13,14, …, n, ∀j (24)

6. If a waiter is assigned to the night shift, he/she should not be assigned to the morning shift the following day,

$X_{ijk} + X_{i(j+1)(k-2)} \leq 1$ i = 13, 14, …, n, j = 1,…,6, k = 6 (25)

4.4.3. Goal constraints

1. Ensure that the number of shifts assigned to each busser in the morning, mid-day, and evening is as evenly distributed as possible.

Night Shift;

$\sum_{j=1}^{g} X_{ijk} + d1n_i - d1p_i = 4$ i = 1,2,…,12, k = 3 (27)

Mid-day Shift;

$\sum_{j=1}^{g} X_{ijk} + d2n_i - d2p_i = 3$ i = 1,2,…,12, ∀j, k = 2 (28)

Morning Shift;

$\sum_{j=1}^{g} X_{ijk} + d3n_i - d3p_i = 2$ i = 1,2,…,12, ∀j, k = 1 (29)

2. Ensure that the number of shifts assigned to each waiter in the mid-day, and evening is as evenly distributed as possible.

Night Shift;

$\sum_{j=1}^{g} X_{ijk} + d5n_i - d5p_i = 3$ i = 13,14…n, ∀j, k = 6 (30)

Mid-day Shift;

$\sum_{j=1}^{g} X_{ijk} + d6n_i - d6p_i = 3$ i = 13,14,…,n, ∀j, k = 5 (31)

3. Ensure that all waiters and bussers work on Friday as much as possible.

Bussers' Constraint;

$\sum_{k=1}^{3} X_{ijk} + d4n_i - d4p_i = 1$ k = 1,2,3, i = 1,2,…,12, j = 5 (32)

Waiters' Constraint;

$\sum_{k=4}^{t} X_{ijk} + d7n_i - d7p_i = 1$ k = 4,5,6, i = 13,14,…,19, j = 5 (33)

4.5. Objective Function

$$\text{MinZ} = (\sum_{i=1}^{12} d1n_i - d1p_i + d2n_i - d2p_i + d3n_i - d3p_i + d4n_i + \sum_{i=13}^{19} d5n_i - d5p_i + d6n_i - d6p_i + d7n_i) \quad (34)$$

In the solution of the developed model, a computer with Intel Core i5, 2.30 GHz, 6 GB memory and Windows 10 operating system was used. The GAMS 22.5 package program was used to solve the model. With the solution of the model, weekly work plans of the busser and waiter personnel in the restaurant were created.

The weekly shift schedule of the bussers is shown in Table 2, and the weekly shift schedules of the waiters are shown in Table 3. In parallel with the model constraints, the shifts of all personnel were fairly distributed. All busser and waiter staff were assigned to work six days a week. On weekends, all bussers and waiters were assigned to work in different shifts. No assignments were made to morning shifts after night shifts. While it is requested that the personnel assignments be as balanced as possible, all personnel are expected to work as much as possible on Fridays. In parallel with this restriction, while all the bussers are on duty on Friday, only one waiter is off on Friday.

Table 2. Shift Schedule for Bussers

	1	2	3	4	5	6	7
	(Monday)	**(Tuesday)**	**(Wednesday)**	**(Thursday)**	**(Friday)**	**(Weekend)**	**(Weekend)**
Morning	B2	B1	B3	B1	B12	B1	B1
08:00- 18:00	B5	B8	B4	B4	B10	B3	B4
	-	-	B11	B8	B9	B9	B11
Mid-day	B4	B3	B1	B9	B1	B4	B12
12:00- 22:00	B7	B6	B2	B11	B3	B7	B9
	B12	B10	B8	B10	B5	B11	B5
	-	-	B12	-	B6	B6	B10
Night	B6	B7	B6	B2	B2	B2	B2
16:00- 02:00	B11	B12	B10	B3	B4	B10	B6
	B9	B9	B5	B5	B11	B5	B3
	-	-	-	B7	B7	B12	B7
	-	-	-	-	B8	B8	B8

Table 3. Shift Schedule for Waiters

	1	2	3	4	5	6	7
	(Monday)	**(Tuesday)**	**(Wednesday)**	**(Thursday)**	**(Friday)**	**(Weekend)**	**(Weekend)**
Morning **08:00- 18:00**	W2	W3	W7	W4	W6	W5	W1
Mid-Day	W3	W5	W4	W3	W7	W1	W3
12:00- 22:00	W7	W7	W5	W5	W5	W4	W4
	-	-	-	-	-	W7	W5
Night	W1	W4	W1	W1	W1	W6	W6
16:00- 02:00	W4	W6	W2	W2	W2	W2	W2
	W6	-	W6	-	W3	W3	W7

One of the constraints is that the bussers and waiters have one day off per week. The days off of the bussers are shown in Table 4. Accordingly, four bussers are off on Monday, four on Tuesday, two on Wednesday, and two on Thursday. The days off of waiters are shown in Table 5. One of the waiters is off on Monday, two on Tuesday, one on Wednesday, two on Thursday and one on Friday. In line with the constraints determined in the model, no personnel were considered to be off at the weekend. As a result of the modelling, shift assignments of all service personnel were carried out in a balanced way in line with the operational expectations.

Table 4. Days Off for Bussers

Busser No:	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**
Day Off:	Monday	Tuesday	Monday	Tuesday	Tuesday	Thursday
Busser No:	**B7**	**B8**	**B9**	**B10**	**B11**	**B12**
Day Off:	Wednesday	Monday	Wednesday	Monday	Tuesday	Thursday

Table 5. Days Off for Waiters

Waiter No:	**W1**	**W2**	**W3**	**W4**	**W5**	**W6**	**W7**
Day Off:	Tuesday	Tuesday	Wednesday	Friday	Monday	Thursday	Thursday

5. Conclusion and Suggestions

Personnel scheduling aims to determine the working periods of employees considering the staffing needs in line with business objectives. Such scheduling plays a crucial role in restaurant operations as incorrect staffing levels and shift arrangements can impact business profitability. Additionally, having employees work at a high pace and for long durations can have a negative effect on job performance and service quality. In this context, various mathematical modelling methods can be used to assign employees to shifts in a fair and balanced manner. Goal programming can provide results that are closest to the desired or ideal assignment conditions.
Therefore, when it is not possible to achieve certain desired or ideal assignment conditions due to specific constraints, goal programming can help find a more flexible and closer-to-ideal solution. This study aims to create shift schedules for the service staff at a leading restaurant chain's branch in Eskişehir, Turkey. The study makes an important contribution to the literature as there are few studies related to the scheduling of restaurant employees. In the first stage of the research, a mathematical model is created, parameters are defined, decision variables are identified, and constraints are established based on business and personnel preferences. As a result of the study, separate work schedules are created for bussers and waiters. Different numbers of personnel are required on different days and shift periods for bussers and waiters in the restaurant. The aim is to assign personnel in a fair and equal manner. By considering business objectives, personnel preferences, and shift characteristics, shift schedules are created using the goal programming method. As a result of the study, each employee is ensured to work six days a week, with one day off. Weekends are the busiest days for the restaurant. Since weekends cannot be given as days off to the employees, shift assignments are made in a way that all personnel serve on those days. Night shifts end at 02:00. Assigning a staff member to a morning shift at 08:00 on the following day after working a night shift can create problems in terms of the employee's quality of life and job performance. Therefore, an employee assigned to the night shift is not assigned to the morning shift on the following day. Fridays are not as busy as weekends, but they are busier compared to other weekdays. The business expects all employees to work on Fridays if possible. In the generated shift schedule, except for one employee, all employees are assigned to work on Fridays. The results of this study can help restaurant businesses have knowledge about personnel scheduling and create work plans more effectively. This can contribute to creating a harmonious and trustful environment within the organization while enhancing employee performance. Imbalanced and unfair shift assignments within the organization can trigger organizational cynicism and negatively affect employee organizational commitment.

Balanced and fair distribution of shifts can contribute to cost savings in management while enhancing the quality of work life for employees. When it comes to arranging work shifts, restaurant managers encounter two-fold difficulties: dealing with having too many staff members which leads to high labor expenses, and having too few staff members, which increases the risk of service mistakes (Choi, Hwang and Park, 2009). Mental and physical burdens created by unbalanced shift plans on employees may cause a decrease in the performance of personnel who are in one-to-one communication with the customer. Customer dissatisfaction will cause the restaurant to lose customers. A high turnover rate will bring along various financial and time costs, such as hiring new staff and training costs. Fair staff scheduling in restaurants addresses challenges by distributing shifts equitably among employees, enhancing morale and engagement, reducing turnover, and improving service quality while minimizing errors. Similar goal programming applications in restaurants can ensure these benefits. Moreover, this approach helps reduce disputes and ensure legal compliance by avoiding overtime, ultimately resulting in a positive workplace culture and customer satisfaction.

This study has several limitations. First of all, this study was carried out in a restaurant in Eskişehir. Different restaurants may have different constraints, needs and purposes. In future studies, shift schedules for service personnel in fast-food restaurants, fine-dining restaurants, and other restaurants with different needs and constraints can be created using the goal programming method. New models can be developed by adding different constraints and personnel preferences to the model. However, goal programming models may not be an effective solution method as they can push the memory and speed limits of computers when dealing with large-scale problems. Various meta-heuristic methods can be used to address large-scale personnel scheduling problems in restaurants. In this study, it is limited to the data that the restaurant can provide. Various data, such as employee preferences, employee salaries, and overtime wages, could not be obtained, and these constraints could not be added to the model. By adding these constraints in future studies, the results can be compared.

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