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ASSESSING FAST-FOOD RESTAURANT'S PRODUCTIVITY IN RURAL AREA THROUGH CUSTOMER WAITING TIME AND WORKER'S EFFICIENCY

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Abstract. *Fast food restaurant is known for its role in providing quick meals for the masses, thus it is critical to ensure the customer's waiting time and employee's efficiency match with its function. However, in the rural area, such issue has yet to be fully implemented. The general quality control practiced for restaurants in Malaysia aim to complete order within (maximum time) 5 minutes, thus this study would like to investigate whether such quality control is also visible in the franchise of the smaller town. This study shows long duration of customers' waiting time (average time of 9.09 minutes on Tuesday and 24.19 minutes on Saturday) and low level of employees' efficiency (55% on Tuesday and 20.67% on Saturday) in this restaurant. Initiatives such as self-service ordering kiosk and free Wi-Fi can improve customers' perception towards the service in this restaurant.*

Keywords: *Waiting time, service rate, efficiency, queueing model.*

Introduction

Eating out has become a lifestyle for the working parents (Jabs & Devine, 2006; Dharmawirya et al, 2012; Morin et al., 2013), students (Seo, Lee & Nam, 2011; Shah et al, 2014), and also deem as socialization activity (Bugge & Lavik, 2010; Edwards, 2013;). As fast food restaurants offer comparatively lower prices and quick meals in their selection of menu than the fine dining restaurants, many people opts to eating out in these restaurants (Habib, Abu Dardak & Zakaria, 2011; Thornton, Bentley & Kavanagh, 2011).

The critical issues in fast food service industry is on the speedy waiting time, as this industry should provide the quick-easy for grab products as claimed (Davis, 1991; Bougoure & Neu, 2010). These worldwide restaurants focused more on customer service as part of their competitiveness, where McDonald's Corporation's primary focus is on its service, and Domino's Pizza provide pizza's replacement guarantee if they fail to fulfill delivery within 30 minutes (Kara, Kaynak & Kucukemiroglu, 1995). Dhamawirya et al. (2012) highlighted waiting time, workers attitude and food quality are main contributing factors that influence the customers' satisfaction, while Madadi (2013) associates the efficiency of workers that contribute to customer's waiting time. Lee & Lambert (2007) and Polas *et al*. (2018) also emphasizes high correlation between waiting time and customers' perceptions on service quality in restaurants, and in other related service industry (Misiran *et al.,* 2017; Mustafa, Salim & Watson, 2018; Gupta, 2018). Friedman & Friedman (1997) highlighted the possibility for potential customer to leave the system if the assess the waiting time negatively, irrespective of quality product offers by the restaurants, resulting to the loss of customers. Recently, majority of fast food restaurants provide alternative such as drive-through counter, delivery service and self-order service in order to improve customer's waiting time.

Copper (1981), Davis & Vollman (1990) and Molla (2017) proposed the use of queuing theory, a mathematical based technique for analyzing waiting line for service industry. This theory is able to approximate real queuing situation or system so that its behavior can be analyzed mathematically. Some extracted assessments from this procedure include multitude of factors such as arrival time, waiting time, queuing length, service time, arrival rate, service rate staffing level and restaurant facility availability.

As the waiting time is perceived as critical indicator to the performance of service for fast food restaurants, this study narrows its perspective to the small town Changloon, the rural area in Malaysia, where the population is low, and fast food restaurants are scarce. This study would examine whether customer's waiting time is still deeming as important factor in this restaurant through the assessment of customer's waiting time and worker's efficiency. In this case study, one franchise of fast food restaurant that operates seven days a week was selected. It has 3 counters in service and opens from 9.00 am to 11 pm. Currently, they only have traditional platform, whereby once a customer enters the restaurant, they will need to queue at any counters that they choose. Observation study was made from 8.30pm to 10.30pm for two days – Tuesday (on weekday) and Saturday (on weekend). Though the population in Changloon is low, this small town is near to public universities, Matriculation College, and the Malaysia-Thailand border. Thus, this small town is expected to be flooded with customers over the weekend. The general quality control practiced by these restaurants in Malaysia is aim to complete the order within (*maximum time*) 5 minutes, thus this study aims to investigate whether such quality control is also visible in the franchise of the smaller town. The customer's waiting time and employee's efficiency will be measured by using queuing model of M/M/3 (Yakubu & Najim, 2014).

Methodology

This study used quantitative approach, where the data is collected one day during weekday (Tuesday) and one day during weekend (Saturday). The data only collected during peak hours from 8:30 p.m. until 10:00 p.m. There were 103 customers on Tuesday and 84 customers on Saturday. The average of waiting time per customers on Tuesday is 9.09 minutes and on Saturday is 24.19 minutes. Figure 1 illustrates the system under study. There are three active service counters during the study period.

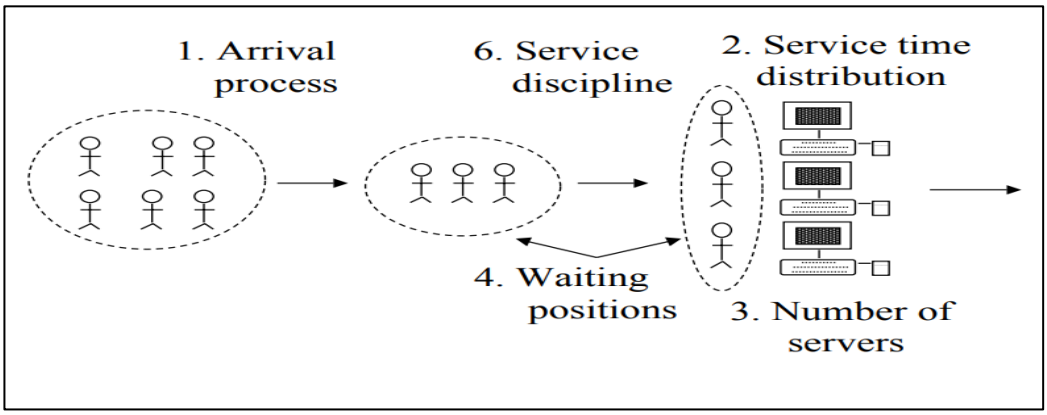

Figure 1: Restaurant Operation Model

Based from prior information, a queuing model of M/M/3 is adopted in this study, with its arrival follows Poisson distribution and service time is exponentially distributed.

The assumptions are as follows:

- The number of customers is infinite.
- Using Poisson distribution.
- Service discipline is used as customer behavior on a "First Come First Serve" and do interfere.
- Exponential distribution is used as service time.
- The average service rate for utilization factor of $\rho<1$ is faster than average arrival rate.

Table 1 Presents The Primary Data Collected from This Study.

	Tuesday	Saturday
Counter 1	312 minutes	609 minutes
Counter 2	114 minutes	715 minutes
Counter 3	510 minutes	708 minutes
Total	936 minutes	2032 minutes
Number of customers	103	84
Average	9.09 minutes	24.19 minutes

Table 1. Waiting Time and number of customers on Tuesday and Saturday between 8.30 pm to 10pm

Table 1 shows the average waiting time is 9.09 minutes on Tuesday and 24.19 minutes on Saturday. However, the number of customers on Tuesday is 103, which is more than the number of customers on Saturday (84 customers).

Results and Discussion

Little's Theorem

Little theorem helps to determine the average number of items in stationary queuing system. This theorem is based on the average waiting time of an item within the system. In this study, Little's theorem (Sundari & Srinivasan, 2012) is adopted since it can describe the relationship of the arrival time, service rate and departs time of customers in buying food at fast food restaurant in Changloon. It is also suitable and relatable for a wider class of queuing models. This study also able to determine the expected numbers of customers in a steady state by using the equation

$$L = \lambda W,$$

where λ represents the mean arrival rate of customers into the line, and W represents the expected waiting time in the line. From the equation, the following was concluded:

- L increases if λ or W increases as well.
- If L increases or W decreases, it would result in the increase of λ.
- W would increases if λ decreases of L increases.

Table 2 Indicates The Arrival Times (Λ) And Theoretical Waiting Time (W_t) For Tuesday and Saturday.

Variables	Tuesday	Saturday
λ (in customer/min)	1.14	0.93
W_t (in min)	29.82	30.11

Table 2: Arrival time and theoretical waiting time

The finding shows that the actual waiting time do not vary much on Saturday as the average actual waiting time, W_a, is 24.19 minutes versus theoretical waiting time is 30.11 minutes. However, on Tuesday, the average of actual waiting time, W_a, is 9.09 minutes while the theoretical waiting time, W_t, is 29.82 minutes. From the above calculation, it could estimate that the average number of expected customers in the fast food restaurant in Changloon by using Little's theorem would be

$$L = \lambda W_a = 1.14 \times 9.09 = 10.36 \approx 11 \; customers.$$

From the above calculation, within the actual average waiting time of 9.09 minutes, services in this restaurant could serve 11 customers on Tuesday, while on Saturday, 23 customers can be served within the actual average waiting time of 24.19 minutes.

$$L = \lambda W_a = 0.93 \times 24.19 = 22.4967 \approx 23 \; customers.$$

Queuing Model and Kendall's Notation

Queuing model and Kendall's Notation is one of the tools for designing and evaluating the performance of queuing system. It is also a standard system to describe and classify queuing notes. There are a few factors that influenced the queuing model such as arrival time distribution, service time distribution, number of servers, queue lengths, system capacity and queuing discipline. However, queue lengths, system capacity and queuing discipline are optional for this study.

In analyzing the queuing model, the variables that need to be calculated and investigated are as follows:

- λ : The mean customers arrival rate
- μ : The mean service rate
- $\rho = \lambda / s\mu$: utilization factor

Table 3 Indicates The Service Rate (M) And Utilization Rates (P) On Tuesday And Saturday.

Variables	Tuesday	Saturday
μ	1.2436	0.9704
ρ	0.3056	0.3195

Based on this study the utilization rate is low during the observation period on Tuesday and Saturday, which is 0.3056 and 0.3195, respectively. When utilization factor is decrease, the mean number of customers will decrease, as the utilization factor is directly proportional with the mean number of customer. From this study, it can be concluded that the customer's waiting time is high on Saturday even though the number of customer is less compared to Tuesday, which is 24 minutes for 23 customers. Then, the number of customer that can be served per minutes will decrease.

Workers' Efficiency

In order to know the efficiency of the employees this fast food restaurant, the efficiency equation is utilized

$$\text{Efficiency} = \frac{\text{Standard labor hours}}{\text{amount of time worked}} \times 100$$

Table 4 Indicates The Efficiency of The Employees In This Restaurant

	Tuesday	Saturday
Standard labor hours (in minutes)	5	5
Amount of time worked (in minutes)	9.09	24.19
Efficiency	55%	20.67%

Table 4. Efficiency of Workers on Tuesday and Saturday

From Table 4, it can be seen that the efficiency rate for workers on Tuesday and Saturday are 55% and 20.67%, respectively. Such findings can conclude that during weekdays, the efficiency rate of workers are low, while on weekends, the efficiency is very low. Customer's waiting time during weekdays and weekend is longer than the expected time, very far from the stipulated 5 minutes quality control. This finding is consistent with the measured level of employees' efficiencies, which is at level 55% on Tuesday and 20.67% on Saturday.

Among ways to improve the performance of this restaurant is through designing better operation flow management and considering customer's perception (Dhamawirya *et. al*., 2012). Self-service order kiosk can help to improve the operation flow by cutting queuing time and waiting time can be done in their respective tables, consequently will improve customer's perception and experience. Other possible initiative include more offerings of promotional items that can help in reducing negative impact of waiting for a long period of time. Davis and Heineke (1994) found that customers that are occupied tend to perceive shorter waiting time compared to customers that are unoccupied. This restaurant can make use of providing free Wi-fi, or allocate a television set in strategic location to keep customers occupied while in queue.

Conclusion

In this study, queuing model and Kendall's notation were used to investigate the performance of the fast food restaurant in a rural area of Changloon through customer's waiting time and employees' level of efficiency. The findings indicate that in within actual average waiting time of 9.09 minutes, services by this fast food restaurant can serve up to 11 customers on Tuesday, while and an estimated of 23 customers within the actual average waiting time of 24.19 minutes on Saturday. The utilization rate on Tuesday and Saturday are low which is 0.3056 and 0.3195, respectively. This is consistent with employees' efficiencies that show low performance of 55% on Tuesday and very low of 20.67% on Saturday. It is recommended to provide self-service

ordering kiosk in order to combat long queue that would result in longer waiting time. Promotional items could also be distributed to customers in order to reduce negative perception. Other initiatives include the access of free Wi-fi and a television set is functional in strategic location to keep the customers' occupied while in queue.

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