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Optimizing the Queueing System of a Fast Food Restaurant: A Case Study of Ostrich Bakery

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***Abstract*--A fast food restaurant is a quick service restaurant which is characterized both by its fast food cuisine and by minimal table service [3]. The Ostrich Bakery is an example of a fast food restaurant which is considered based on the Existing Structure of its queuing model and the Proposed Structure of that queuing model. The Poisson Distribution and the Exponential Distribution will be encountered in the queuing model. The channels of the queuing model that operate in the Ostrich Bakery will be analysed. The formulae for the measures of performance of a queuing system are adopted from models derived by Prof. Ikpotokin from his paper based on 'Stochastic model of a linked queue network'. It has a queuing system with n-servers in parallel and linked to another server in series.**

***Keywords*-- Cuisine, Exponential Distribution, Model, Parallel Channel, Poisson Distribution Queuing Model, Series Channel .**

I. INTRODUCTION

The Ostrich Bakery is described as a fast food restaurant since it is characterized both by its fast food cuisine and by minimal table service [3]. This quick service restaurant (QSR) will be analyzed under a queuing model which assesses the behavior of the system for the purpose of improving its performance. The queuing model determines the measures of performance of waiting lines, such as the average waiting time in the queue and the productivity of the service facility which can then be used to design the service installation.

The Ostrich Bakery operates on a daily quantity demand in such a way that customers can take away their orders immediately after payment or provision for a seating area is available for the customers. The queuing model based on the Ostrich Bakery portrays a diagram of the arrival rate and service rate of the customers. The model is considered as a multi-server model. Its pattern of service channel is a multi-channel which is described as a series channel which is subdivided into sections of parallel channels. The Poisson distribution which is encountered in queuing problems gives the mean arrival rate (λ) of customers. The Exponential distribution gives the mean service rate (μ) of customers. The queuing model analysis with respect to the Ostrich Bakery is in a steady state condition since its behavior is independent of its initial conditions and of the elapsed time [5].

The Ostrich Bakery in Kaduna along Ahmadu Bello Way is used as the case study since it is the headquarters in Kaduna. This fast food branch operates in a way that customers can take away their orders immediately after payment. Other branches usually have a seating area in which customers can eat the food they order on the premises. The several branches in Kaduna are: Sabon Gari, Tudunwada, Barnawa, Katuru road by NAF club, Ahmadu Bello Way and many others. Ostrich Bakery is a National fast food restaurant since it has several branches in Nigeria like Makurdi, Jos ,Gombe, Funtua, Ilorin, Enugu, Lokoja, Kaduna and many others.

Since Ostrich Bakery is a fast food restaurant, customers will expect a quick service. Therefore the demand of hospitality point of sale system is relevant to ensure accuracy and security [3].

Reason for the Research Work

The popularity of fast food restaurants to consumers is for several reasons:

i) Fast food can be reassuring to a hungry person in a hurry or far from home i.e. fast service.
ii) Families can get a quick meal which gives a break from the routine of home cooking.
iii) High-end restaurants are expensive and impractical for families with children. Despite this, many of the operators are not realizing optimal efficiencies that would result from the application of better service channels in their daily operations. In cases like traffic intensity where the ratio of the arrival rate to the service rate is high, congestion results to balking, reneging, or jockeying by the customers. The queuing model is considered to asses this problem. This research will proffer some solutions based on our case study of Ostrich Bakery, Kaduna which can be useful to other similar organizations.

Scope of Study

This study focuses on the queuing operations in a fast food restaurant, using Ostrich Bakery as the case study. The queuing system that operates in the Ostrich Bakery will be analyzed based on the basic characteristics of a queuing model.

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II. Literature Review

There exists an overwhelming body of literature devoted to the study of queues. Real-world queuing problems demand materials necessary to solve the particular queuing problem. A queuing system consists of three basic elements: customers, servers and randomness [1]. A queuing system is defined as the collection of activities and events associated with providing service to an arriving customer. Thus the Ostrich Bakery fast food restaurant can be referred to as undertaking a queuing system [1]. Symptomatic of queuing systems are waiting lines. Considering the Ostrich Bakery along Ahmadu Bello Way, Kaduna which is the Headquarters branch, it operates in a queuing system thus: customers that come in vehicles have a parking lot to park in the premises before they go through the entrance. Customers without vehicles can go straight through the entrance. Next, customers proceed to the parallel servers (Server 1 and Server 2) to make orders for the products of their choice which are displayed through a glass show case with price tags attached respectively. Customers are attended to by Server 1 or Server 2 respectively. Cases where queues may arise, customers can jockey from one queue to another as is convenient. This section is called the Ordering Section where Server 1 and Server 2 operate. After the Ordering Section, the customers proceed with their orders on a tray to Server 3 who is at the Payment Section. The Ordering Section is a link to the series channel at the Payment Section. The Server 3 at the Payment Section packages the customer's order after payment in a leather bag or carton respectively, then the customer leaves the premises immediately after service. The identification of the queuing system is extremely important.

In the Ostrich Bakery, cases of congestion may arise when the arrival rate of customers is high. The high rate of arrival is mostly during lunch time (12pm to 4pm) and during weekends (Friday, Saturday), Sundays and Public holidays. Observation shows that within every minute of the busy times, one customer always arrives. After assessing the Existing Structure of the Ostrich Bakery, a Proposed Structure is deployed which should be superior to the former. Rather than concentrate on the arrival rate of the customers, the Ordering Section is deployed with an extra server to prompt the link into the series of the Payment Section of servers. This act should play a great part in decreasing waiting lines or queues in the fast food restaurant.

Waiting lines or queues seem as inevitable a consequence of modern life as death and taxes. In fact, I must say, I had to go through a duration of time to wait in line during the process of data collection in order to make accurate observations.

Considering the queuing system in the Ostrich Bakery, it focuses on the arrival population, service population, queue discipline and service discipline [15]. The arrival population has an infinite population size since the probability of a customer arriving for service is not significantly affected by the number of customers already at the service facility. The service population in the system has multiple servers and in the Ordering Section, the servers are in parallel, which are linked in series to the server in the Payment Section. The queue discipline in the system shows that the customers jockey from one queue to the other when there is congestion, some customers may renege, that is leave the system after entering the line , but before being served. When customers are served, they leave the premises immediately after payment, thus there is no limit to the number of customers that can be in the system. The service discipline in the queuing system shows that the manner in which the customers are served is 'first come, first served' (FCFS).

The queuing model of the Ostrich Bakery is a descriptive model which describes the behavior of the system. Thus, after the queuing system is analyzed, the problem is identified and then a model is developed to solve the problem. The "development" of the model may well involve the application of an Existing model which is selected based on the characteristics of the problem. The properties of the Existing queuing model in the Ostrich Bakery system has Poisson distributed arrivals (λ_n) , Exponentially distributed service times (μ_n) and c parallel service channels that is, (M\M\c) queue. The steady state general balance equations for the (M/M/c) queue are often referred to as birth-death equations. The analogy is drawn between births and arrivals and between deaths and services (departures) [1]. Guiasu, Hillier and Lieberman(2001) noted that a queuing system is in steady state condition if the state of the system becomes essentially independent of the initial state and the elapsed time. They also noted that the main results in queuing theory are obtained when the queuing system is in steady state condition and the requirements of a birth-and-death stochastic process are satisfied (p.75).The steady state probability that there are n_i customers in the system is denoted by $P(n_i)$.

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Measurements of the systems operating characteristics of the Ostrich Bakery are analysed based on L_S (expected number in the system that is, waiting and service), L_q(expected number waiting), W_S(expected time spent in the system) and W_q(expected time spent waiting) [1]. The traffic intensity (ρ) , plays an important role in the analysis of the queuing system. Kendall's notation of representing queuing models (1953) serves as a sample to deal with the waiting time and queue length of the customers' in the Ostrich Bakery. Using models derived by Ikpotokin based on 'Stochastic model of a linked queue network', it has a queuing system with n servers in parallel and linked to another server in series [12]. Formulae for the measures of performance of the system are applied in the Existing Structure of the queuing system in the Ostrich Bakery. The Proposed Structure for the Ostrich Bakery also gets its support from Ikpotokin's (2003) statement which says that;"increasing the number of service channels in the system is one way to reduce the queue size and the mean wait of unit in the system. This has resulted in multi-channels which siphon off the arriving units into many channels and so make the queue shorter."

III. Methodology And Data

A. Model Formation

This queuing theory analysis focuses on the system which is in a steady state condition since its behavior is independent of its initial conditions and of the elapsed time.

The major constituents of a queuing system are shown in FIGURE I

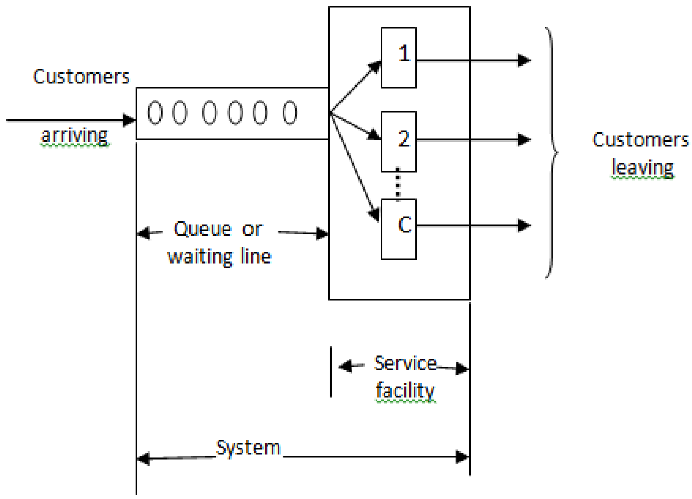

Figure I The Major Constituents Of A Queuing System

FIGURE I shows that customers have an arrival rate which may be regular or irregular (random arrivals). They form a queue at the service channels. When service has been completed, the customer leaves the system. The seven main elements of a queuing system are used to explain the queuing operations in the Ostrich Bakery.

1. *Arrival Distribution:* This represents the pattern in which the number of customers arrive at the fast food restaurant. In the Ostrich Bakery, customers have a random arrival since they arrive at irregular intervals of time. When arrivals are random, the Poisson probability distribution will describe the number of customers arriving. The Mean value of arrival rate is represented by λ. In the Ostrich Bakery, customers arrive at various sections to fulfill their demands. Thus, λ_n is recorded according to the number of sections (n) the customer has to pass through.

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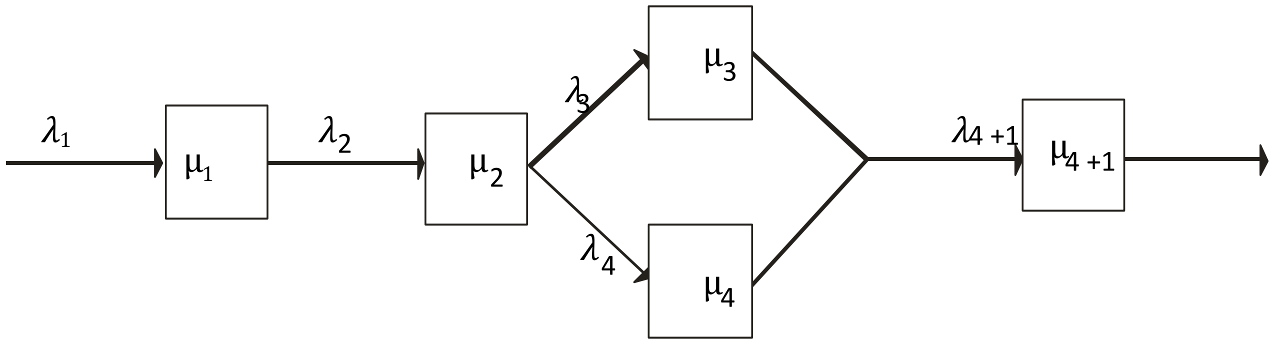

Figure II Existing Model Structure Of The Ostrich Bakery

Poisson distribution can handle random phenomena wherein it is possible to prescribe the number of times an event occurs, but not the number of times it does not occur. A typical application of the Poisson distribution occurs in analyzing queuing problems. Poisson distribution characteristics are illustrated in the number of customers arriving in the Ostrich Bakery Fast food Restaurant at each section.

2. *Service Distribution:* It represents the pattern in which, the number of customers leave the service facility. In the Ostrich Bakery, since the service times are randomly distributed, the Exponential probability distribution will best describe the service times. Exponential distribution is encountered in queuing problems as a probability model for service time, which is acquired from the Ostrich Bakery. The average number of customers served per unit of time is called the Service rate which represents μ. In the Ostrich Bakery, servers attend to customers at the respective sections. Thus, μ_n is recorded according to the number of sections (n) the servers have to attend to the customers.

3. *Service Channel:* The Ostrich Bakery service channel handles a combination of a parallel-series channel. There is a Car park section for customers who arrive in their cars, then an Entrance section for all the customers to pass through. Customers proceed to the Ordering section, where they are served simultaneously (parallel servers) by Server 1 or Server 2. The customers then proceed with their orders on a tray to the Payment section (Server 3), to pay for their orders. After this series, the customers leave the premises.

The queuing model in the Ostrich Bakery is considered as a Multi-channel (parallel-series) model. It is represented in FIGURE II

4. *Service Discipline:* Service discipline or order of service is the rule by which customers are selected from the queue for service.

The Ostrich Bakery follows a service discipline of "first come, first served" (FCFS). The order of service is related to service time which affects the queue length or average waiting time.

5. *Maximum number of customers allowed in the system:* This is based on the arrival source capacity. The Ostrich Bakery is not affected by the number of customers in the hall because once they are served, they leave the premises immediately. The maximum number of customers in this system is infinite.

6. *Calling Source or Population:* The arrival pattern of the customers depends upon the source which generates them. The Ostrich Bakery has a large number of potential customers thus, the calling source is infinite.

7. *Customers Behaviour:* In the Ostrich Bakery the multi-server model shows that in the parallel channels with respect to each series, when customers arrive, each customer can select the line he/she wants to join for convenience, without external pressure. There are several short lines infront of each service station. Customers can jockey from one queue to another in the hope of reducing waiting time.

The queuing model in the Ostrich Bakery follows Kendall's notation for representation. Kendall (1953) and later Lee (1966) introduced useful notation for queuing models. The complete notation is expressed as (a/b/c):(d/e/f)

a = Arrival (or inter arrival) distribution

b = Service time distribution

c = Number of service channels in the system

d = Service discipline

e = Maximum number of customers allowed in the system

f = Calling source or population

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The queuing model that best illustrates the operation of Ostrich Bakery is M/M/c: FCFS/∞/∞ whose Kendall model is (M/M/4: FCFS/∞/∞). For the analysis of the Ostrich Bakery data, using models derived by Ikpotokin[12], the measures of performance of the system are thus:

1. Expected (average) number of customers in the system:

$$Ls = \sum_{j=1}^{n} \frac{\lambda j}{\mu j - \lambda j} + \frac{\sum_{j=1}^{n} \lambda j}{\mu_{n-1} - \sum_{j=1}^{n} \lambda j}$$

2. Expected (average) number of customers in the queue:

$$L_q = \sum_{j=1}^{n} \frac{\lambda_j^2}{\mu_j(\mu_j - \lambda_j)} + \frac{\left(\sum_{j=1}^{n} \lambda_j\right)^2}{\mu_{n+1}\left(\mu_{n+1} - \sum_{j=1}^{n} \lambda_j\right)}$$

3. Average time a customer spends in the system:

$$w_s = \sum_{j=1}^{n} \frac{1}{\mu_j - \lambda_j} + \frac{1}{\mu_{n+1} - \sum_{j=1}^{n} \lambda_j}$$

4. Average waiting time of a customer in the queue:

$$w_q = \sum_{j=1}^{n} \frac{\lambda_j}{\mu_j(\mu_j - \lambda_j)} + \frac{\sum_{j=1}^{n} \lambda_j}{\mu_{n+1}\left(\mu_{n+1} - \sum_{j=1}^{n} \lambda_j\right)}$$

5. Traffic intensity:

$$\rho_n = \frac{\lambda_n}{\mu_n}$$

The steady state general balance equation for the queuing system shows that $t \to \infty$ thus, the Probability distribution $P_n(t)$ is no longer a function of t, then t can be excluded. For $n=0$, $P_{n-1}(t)$, λ_{n-1} and $\mu_n=0$ (there must be a zero departure rate if there are no units present).

To determine the Probability distribution (P_n) for the number of customers in the Ostrich Bakery, use P_n to compute values in terms of P_0. Therefore,

$$P_n = \prod_{K=1}^{n} \frac{\lambda_{K-1}}{\mu_K} p_0 \qquad 1 \le n \le N$$

Note: to determine the Probability distribution (P_n) for the number of customers in the Ostrich Backery, we use P_n to compute values in terms of P_0. Sum the values of P_n, set the sum equal to one since $\sum_{n=0}^{N} P_n = 1$, then determine the value of P_0.

Note: we know the value of P_n if the value of P_0 is known.

The Proposed Model Structure for the Ostrich Bakery is represented in FIGURE III

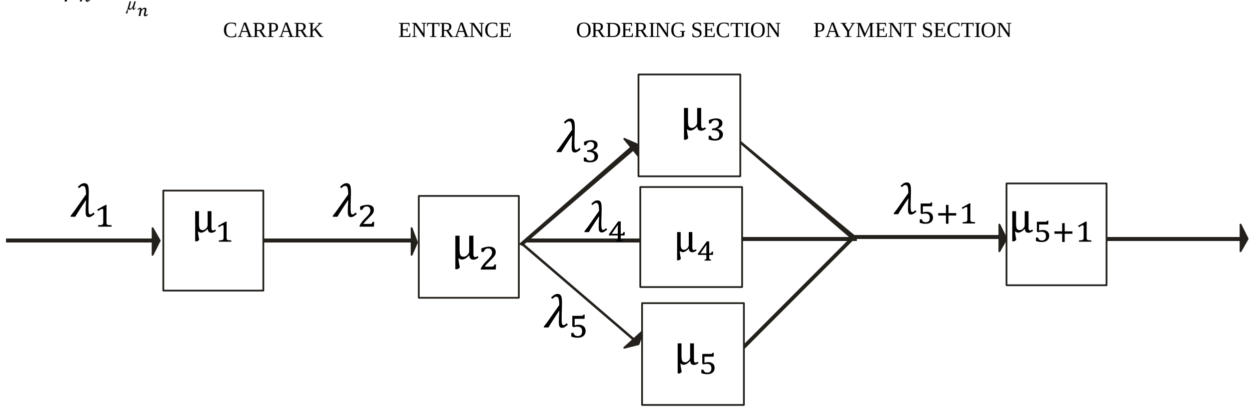

FIGURE III THE PROPOSED MODEL STRUCTURE FOR THE OSTRICH BAKERY.

The Proposed Model Structure shows that an extra server is added to the Ordering section whose Kendall model is M/M/5:FCFS/∞/∞. Customers queue up at the serving point depending on the next available space. Thus, Ordering section 1,2 and 3 have similar queues. The new server μ_5 which is included has a new rate of service which could be 80,120,130 or 140.

These variables will asses the mearurements of the systems operating characteristics of the Ostrich Bakery. The servers for μ_3 and μ_4 in the Existing Structure are maintained in the Proposed Structure. In Payment section, λ_{5+1} and μ_{5+1} have assumed values because it is a Proposed Model.

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Therefore, the Measurements of the systems operating characteristics of the Ostrich Bakery which were analysed based on L_S(expected number in the system that is, waiting and service), L_q(expected number waiting), W_S(expected time spent in the system), W_q(expected time spent waiting) and traffic intensity(ρ) are assessed with respect to the assumed values which will produce decreased results. The Probability distribution (P_n), for the number of customers in the Ostrich Bakery will also be reduced.

IV. Results

Kendall`s notation of representing queuing models classifies the data condition in the Ostrich Bakery as (M/M/4: FCFS/∞/∞) which is a multi-channel queuing theory model**.** In the Existing Structure, values of the queuing parameter is M/M/4:FCFS/∞/∞. In the Proposed Structure, values of the queuing parameter is M/M/5:FCFS/∞/∞.

TABLE I
THE VARIOUS PROPERTIES OF THE MULTI-CHANNEL SYSTEM IN THE EXISTING STRUCTURE OF THE OSTRICH BAKERY

Section(n)	λ_n	μ_n	P_n	P_n	ρ_n
Carpark	40	60	$\frac{\lambda_0}{\mu_1} P_0 = 0$	0	$\frac{40}{60}$
Entrance	76	80	$\frac{\lambda_1}{\mu_2} P_0 = \frac{40}{80} P_0$	$\frac{1005}{3975}$	$\frac{76}{80}$
Ordering section(1)	44	120	$\frac{\lambda_2}{\mu_3} P_0 = \frac{76}{120} P_0$	$\frac{1273}{3975}$	$\frac{44}{120}$
Ordering section(2)	32	120	$\frac{\lambda_3}{\mu_4} P_0 = \frac{44}{120} P_0$	$\frac{737}{3975}$	$\frac{32}{120}$
Payment section	67	67	$\frac{\lambda_4}{\mu_{4+1}} P_0 = \frac{32}{67} P_0$	$\frac{960}{3975}$	$\frac{67}{67}$
			$\frac{3975}{2010} P_0 = 1$, $P_0 = \frac{2010}{3975}$	$\frac{3975}{3975}$	$\sum \rho n = 3.25$

TABLE I gives the values of the queuing parameters of the Existing Ostrich Bakery Structure.

L_s = 20.4065

L_q = 15.2909

W_s = 0.3166

W_q = 0.2557

λ_1 = 40 Customers per hour.

μ_1 = 60 Customers per hour.

λ_2 = 76 Customers per hour.

μ_2 = 80 Customers per hour.

λ_3 = 44 Customers per hour.

μ_3 =120 Customers per hour.

λ_4 = 32 Customers per hour.

μ_4 =120 Customers per hour.

λ_{4+1} = 67 Customers per hour.

μ_{4+1} =67 Customers per hour.

TABLE II is represented in four sub-tables which give the values of the queuing parameters of the Proposed Ostrich Bakery Structure when μ_5 [Ordering section(3)] could be 80,120,130 or 140.

TABLE II A
THE VARIOUS PROPERTIES OF THE MULTI-CHANNEL SYSTEM IN THE PROPOSED STRUCTURE OF THE OSTRICH BAKERY WHEN μ_5 IS 80

Section(n)	λ_n	μ_n	P_n	P_n	ρ_n
Carpark	40	60	$\frac{\lambda_0}{\mu_1} P_0 = 0$	0	$\frac{40}{60}$
Entrance	76	80	$\frac{\lambda_1}{\mu_2} P_0 = \frac{40}{80} P_0$	$\frac{3360}{13572}$	$\frac{76}{80}$
Ordering section(1)	26	120	$\frac{\lambda_2}{\mu_3} P_0 = \frac{76}{120} P_0$	$\frac{4256}{13572}$	$\frac{26}{120}$
Ordering section(2)	25	120	$\frac{\lambda_3}{\mu_4} P_0 = \frac{26}{120} P_0$	$\frac{1456}{13572}$	$\frac{25}{120}$
Ordering section(3)	25	80	$\frac{\lambda_4}{\mu_5} P_0 = \frac{25}{80} P_0$	$\frac{2100}{13572}$	$\frac{25}{80}$
Payment section	70	70	$\frac{\lambda_5}{\mu_{5+1}} P_0 = \frac{25}{70} P_0$	$\frac{2400}{13572}$	$\frac{70}{70}$
			$\frac{13572}{6720} P_0 = 1$, $P_0 = \frac{6720}{13572}$	$\frac{13572}{13572}$	$\sum \rho_n = 3.35$

TABLE II A gives the queuing parameters of the Proposed Ostrich Bakery Structure when μ_5 is 80

L_S= 20.4147

L_q= 14.9721

W_S= 0.3309

W_q= 0.2585

λ_1 = 40customers per hour

μ_1 = 60customers per hour

λ_2 = 76customers per hour

μ_2 = 80cutomers per hour

λ_3 = 26customers per hour

μ_3 = 120customers per hour

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λ_4 = 25customers per hour

μ_4 = 120customers per hour

λ_5 = 25customers per hour

μ_5 = 80customers per hour

λ_{5+1} = 70customers per hour

μ_{5+1} = 70customers per hour

TABLE II B
THE VARIOUS PROPERTIES OF THE MULTI-CHANNEL SYSTEM IN THE PROPOSED STRUCTURE OF THE OSTRICH BAKERY WHEN μ_5 IS 120

Section(n)	λ_n	μ_n	P_n	P_n	ρ_n
Carpark	40	60	$\frac{\lambda_0}{\mu_1} P_0 = 0$	0	$\frac{40}{60}$
Entrance	76	80	$\frac{\lambda_1}{\mu_2} P_0 = \frac{40}{80} P_0$	$\frac{3360}{12872}$	$\frac{76}{80}$
Ordering section(1)	26	120	$\frac{\lambda_2}{\mu_3} P_0 = \frac{76}{120} P_0$	$\frac{4256}{12872}$	$\frac{26}{120}$
Ordering section(2)	25	120	$\frac{\lambda_3}{\mu_4} P_0 = \frac{26}{120} P_0$	$\frac{1456}{12872}$	$\frac{25}{120}$
Ordering section(3)	25	120	$\frac{\lambda_4}{\mu_5} P_0 = \frac{25}{120} P_0$	$\frac{1400}{12872}$	$\frac{25}{120}$
Payment section	70	70	$\frac{\lambda_5}{\mu_{5+1}} P_0 = \frac{25}{70} P_0$	$\frac{2400}{12872}$	$\frac{70}{70}$
			$\frac{12872}{6720} P_0 = 1$, $P_0 = \frac{6720}{12872}$	$\frac{12872}{12872}$	$\sum \rho_n = 3.25$

TABLE IIB gives the queuing parameters of the Proposed Ostrich Bakery Structure when μ_5 is 120

L_S= 20.2292

L_q= 14.885

W_S= 0.3234

W_q= 0.2550

λ_1 = 40customers per hour

μ_1 = 60customers per hour

λ_2 = 76customers per hour

μ_2 = 80cutomers per hour

λ_3 = 26customers per hour

μ_3 = 120customers per hour

λ_4 = 25customers per hour

μ_4 = 120customers per hour

λ_5 = 25customers per hour

μ_5 = 120customers per hour

λ_{5+1} = 70customers per hour

μ_{5+1} = 70customers per hour

TABLE II C
THE VARIOUS PROPERTIES OF THE MULTI-CHANNEL SYSTEM IN THE PROPOSED STRUCTURE OF THE OSTRICH BAKERY WHEN μ_5 IS 130

Section(n)	λ_n	μ_n	P_n	P_n	ρ_n
Carpark	40	60	$\frac{\lambda_0}{\mu_1} P_0 = 0$	0	$\frac{40}{60}$
Entrance	76	80	$\frac{\lambda_1}{\mu_2} P_0 = \frac{40}{80} P_0$	$\frac{43680}{165936}$	$\frac{76}{80}$
Ordering section(1)	26	120	$\frac{\lambda_2}{\mu_3} P_0 = \frac{76}{120} P_0$	$\frac{55328}{165936}$	$\frac{26}{120}$
Ordering section(2)	25	120	$\frac{\lambda_3}{\mu_4} P_0 = \frac{26}{120} P_0$	$\frac{18928}{165936}$	$\frac{25}{120}$
Ordering section(3)	25	130	$\frac{\lambda_4}{\mu_5} P_0 = \frac{25}{130} P_0$	$\frac{16800}{165936}$	$\frac{25}{130}$
Payment section	70	70	$\frac{\lambda_5}{\mu_{5+1}} P_0 = \frac{25}{70} P_0$	$\frac{31200}{165936}$	$\frac{70}{70}$
			$\frac{165936}{87360} P_0 = 1$, $P_0 = \frac{87360}{165936}$	$\frac{165936}{165936}$	$\sum \rho_n = 3.23$

TABLE II C gives the queuing parameters of the Proposed Ostrich Bakery Structure when μ_5 is 130

L_S= 20.2041

L_q= 14.876

W_S= 0.3224

W_q= 0.2546

λ_1 = 40customers per hour

μ_1 = 60customers per hour

λ_2 = 76customers per hour

μ_2 = 80cutomers per hour

λ_3 = 26customers per hour

μ_3 = 120customers per hour

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λ_4 = 25customers per hour

μ_4 = 120customers per hour

λ_5 = 25customers per hour

μ_5 = 130customers per hour

λ_{5+1} = 70customers per hour

μ_{5+1} = 70customers per hour

TABLE II D
THE VARIOUS PROPERTIES OF THE MULTI-CHANNEL SYSTEM IN THE PROPOSED STRUCTURE OF THE OSTRICH BAKERY WHEN μ_5 IS 140

Section(n)	λ_n	μ_n	P_n	P_n	ρ_n
Carpark	40	60	$\frac{\lambda_0}{\mu_1} P_0 = 0$	0	$\frac{40}{60}$
Entrance	76	80	$\frac{\lambda_1}{\mu_2} P_0 = \frac{40}{80} P_0$	$\frac{6720}{25344}$	$\frac{76}{80}$
Ordering section(1)	26	120	$\frac{\lambda_2}{\mu_3} P_0 = \frac{76}{120} P_0$	$\frac{8512}{25344}$	$\frac{26}{120}$
Ordering section(2)	25	120	$\frac{\lambda_3}{\mu_4} P_0 = \frac{26}{120} P_0$	$\frac{2912}{25344}$	$\frac{25}{120}$
Ordering section(3)	25	140	$\frac{\lambda_4}{\mu_5} P_0 = \frac{25}{140} P_0$	$\frac{2400}{25344}$	$\frac{25}{140}$
Payment section	70	70	$\frac{\lambda_5}{\mu_{5+1}} P_0 = \frac{25}{70} P_0$	$\frac{4800}{25344}$	$\frac{70}{70}$
			$\frac{25344}{13440} P_0 = 1$, $P_0 = \frac{13440}{25344}$	$\frac{25344}{25344}$	$\sum \rho_n = 3.22$

TABLE II D gives the queuing parameters of the Proposed Ostrich Bakery Structure when μ_5 is 140

L_S= 20.1834

L_q= 14.869

W_S= 0.3216

W_q= 0.2554

λ_1 = 40customers per hour

μ_1 = 60customers per hour

λ_2 = 76customers per hour

μ_2 = 80cutomers per hour

λ_3 = 26customers per hour

μ_3 = 120customers per hour

λ_4 = 25customers per hour

μ_4 = 120customers per hour

λ_5 = 25customers per hour

μ_5 = 140customers per hour

λ_{5+1} = 70customers per hour

μ_{5+1} = 70customers per hour

V. Conclusion

Increasing the number of service channels in the system has reduced the queue size and the mean wait of unit in the system. The Proposed model has advantage over the Existing model. Thus in the Proposed Structure, all the parameter values are advantageous over the Existing Structure. The **W_S**(Average time a customer spends in the system) in the Proposed Structure is greater than the **W_S** in the Existing Sructure because there are more customers in the Proposed Structure than in the Existing Structure.

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