# Application of Queuing Model in Tourism Management

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***Abstract:*** *Indian Tourism is enjoying a golden era of its development in India. Tourism is playing a vital role in the economic development of India and it can be enhanced by eradicating the waiting list from the tourism management. Our research analysis tries to investigate the role of Queueing M/M/s model in the enhancement of tourism services by providing prompt travelling assistance with any delay or wait list. This paper tries to establish the relationship between some main quantitative indicators to be used strengthening the tourism management specially travelling management so that airways, railways and roadways services might be freed from waiting and delays. The paper tries to conceptualize the applicability and feasibility of the Queueing theory in the tourist linking services. This dimension will enhance the quality to experience delivery structure to the tourist.*

***Keywords:*** *Queueing M/M/s model; Arrival rate and Service rate; Tourist liking degree.*

## 1 Introduction

All along with societal economical growth and national income raise, the persons improve and apply for the life eminence every day. The journey as the enjoying holiday way of persons is in attending the expansion direction being in the growing. We seen in India - Travel & Tourism Total Contribution to GDP - 6.8% share in 2015 [1] The queueing management is the viewpoint of this paper, that is, whether the tourists are satisfied is researched from stripe up waiting viewpoint.

### Classification of queueing model

A queueing model is symbolically represented as A/B/C/: (d/e) where
A = Arrival pattern of the units which is given by the probability distribution of inter-arrival time of unit.
B = The probability distribution of serving time of the unit.
C = The number of serving channels in the system.
D = Capacity of the system.

E= service discipline.

## 2 The elementary theory of queueing theory

### 2.1 Notations

N: the state in a stable-state queueing structure at any time (i.e. the number of all the tourists in the structure)

$P_n$ : a probability under the state being n in a stable-state queueing structure at any time,
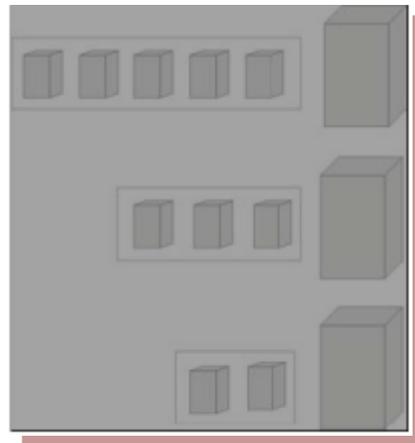
$\lambda$ :Arrival rate

$\mu$ : Service rate

$L_q$ **:** average number of tourists waiting for service in queue

$L_s$ **:** average number of tourists waiting for service in structure

$W_q$ **:** tourists average waiting time in queue

$W_s$ **:** tourists average waiting time in structure



**Multi- Servers/Multi- Queues**

### 2.2 The Queue *M/M/s*

The multi-server queueing models are M / M / s is the model used most in analyzing service stations with more than one server such as banks, checkout counters in stores, check-in counters in airports, etc. The arrival of tourists is supposed to follow a Poisson process, and service times are supposed to have an exponential distribution. We will let the number of servers be s, providing service independently of each other. We also suppose that the arriving tourists from a single

queue and the one at the head of the waiting line enter into service as soon as a server is free. No server stays idle as long as there are tourists to serve.

The structure's service intensity is $\rho = \lambda / s\mu$

.and $\alpha = \lambda/\mu$ so that $\alpha/s = \rho$
The stable probability in the queueing structure could be represented as follows

$$p_0 = \left[\sum_{r=0}^{s-1} \frac{\alpha^r}{r!} + \frac{\alpha^s}{s!}\left(1 - \frac{\alpha}{s}\right)^{-1}\right]^{-1} \qquad (1)$$

$$P_n = \frac{\alpha^n}{n!} p_0$$

$$= \frac{\alpha^s}{s!}\left(\frac{\alpha}{s}\right)^{n-s} p_0 \qquad (2)$$

The seven main evaluating indicators are:

$$\rho = \lambda / s\mu \qquad (3)$$

$$\alpha = \lambda/\mu \qquad (4)$$

$$L_s = \alpha + \frac{\rho\, p_s}{(1-\rho)^2} \qquad (5)$$

$$L_q = \frac{\rho\, p_s}{(1-\rho)^2} \qquad (6)$$

$$W_q = \frac{p_s}{s\mu(1-\rho)^2} \qquad (7)$$

$$W_s = W_q + \text{average number being served} \qquad (8)$$

$$P(N \geq K) = \sum_{n=k}^{\infty} P_n \qquad (9)$$

**Busy era:** The busy era indicates the multi-server queue needed further expansion.

## 3 The motive of tourists' waiting fact

### 3.1 The facility of tourist service's response capability is restriction.

Usually speaking, tourist service's response capability is consistent. That is to declare, the number of service centres is restricted but not unlimited in the queueing model, yet the number of tourists could be measured as an unlimited one. Consequently, it is expected to generate tourists' waiting when the infinite tourists are served by limited service centres. That is an inextricability disagreement. The capacity of service supply has been decisive in the early designed phase in general tourist ventures. Though the capability of service provide could be used to by haphazard the number of service centres and their team, the controlling span is miniature. At the similar time, tourist venture generally designs service structure with board from their own operation cost and management mode. But they can't regard as the tourists' demands entirely. So tourists' queueing

observable fact could only be alleviated properly but evaporate fully.

### 3.2 The tourists' arrival has randomness character

Tourists' travelling activities is generated by travelling intention which is decisive by two issues money and time, to an enormous degree. The tourism mode, utilization psychology and activities tradition of them also affect travelling decision-making to a certain extent.

### 3.3 The tourists' service time has uncertainty nature

The service time of diverse service groups is affected by many-issues. Furthermore, the tourist service is unseen and has harmony between consumption and production. Consequently the service time is not invariable to diverse tourists, and the disparity of service time is the effect of the individual disparity between tourists' service and personnel. These reason the tourists' waiting straight.

## 4 Assessment of tourists' liking

Following assessment indicates the tourists are pleased only from the queueing waiting point of view.

### 4.1 The tourists' arrival rate and the tourists' service time

We use the formula (6) or (7), we can get several helpful outcomes as follows:

**4.1.1.** The waiting-service tourists' mean number in the stable-state structure, Lq or the tourists' mean waiting time in the stable-state structure, Wq become the negative correlation with service strength. If the ρ is greater, the Lq is less it means corresponding waiting time is less. Therefore for attractive the tourists' liking degree, structure's service strength should be improved.

**4.1.2.** The tourists' liking degree in the structure could be improved by rising the number of service counter in the queueing structure. So excluding considering the cost of building and operation of structure itself, tourists' waiting decreasing also should be measured.

**4.1.3.** The waiting-service tourists' mean number in the stable-state structure, Lq (or the tourists' mean waiting time in the stable-state structure, Wq) becomes the inverse correlation with the service efficiency of service groups in the structure, μ. If the μ is higher, the Lq is fewer. So service associations should preparation the essential skills greatly to increase the service effectiveness and to enhance the tourists' liking degree about the structure

### 4.2 The probability of which tourists must wait for

Principle (9) gives the opportunity of tourists having to wait for. Clearly it is not 0 that as well described that, tourists' waiting is ineffaceable. But tourists give observed to that this opportunity should be as small as we are able to, which build tourists can be pleasing by rising service group appropriately.

## 5 Measures for Improving the Tourist Liking Degree

### 5.1 Establish a suitable queueing model

**5.1.1.** Establishment queueing model

A queueing structure is mostly written in to three parts: tourists, service group, input and service procedure. The tourist business should ascertain the rules tourists get into structure and the service rules the group services through collecting data and analyzing for it. They should also build a suitable queueing model to gain all kinds of quantitative index which can reflect its essential character. So they can offer attestation for scientific management and decision-making though analyzing the data. At the same time, tourist enterprises should often check the current state, analyze the possibility of transformation in structure, and give out process that can help to improve the efficiency of structure, in order to reduce the cost for operation and improve tourist service quality.

**5.1.2.** Optimizing the queueing structure

It is unpractical to eliminate queueing in structure, which would cause serious waste of human resource and facilities. But deficient facilities and service will cause too much waiting era, and decrease of tourist. So when tourist enterprises make their optimizing object, they should give attention to the economic benefit of tourists and themselves for the sake of the best result.

The optimizing problem of structure is mainly composed of two parts: designing a perfect structure, optimum control (most superior operation). Designing a perfect structure is the content of creating a structure for the sake of gain the maximal revenue.

### 5.2 Operation queueing management

**5.2.1** Tourist service provisions aspect

Tourist ventures should establish an appropriate capability of reception according to the queueing model they built before. In the tourist busy-hour, it is essential to expand the offering ability, such as increasing establishment and service workers, updating intrinsic establishment, strengthening the training of service workers. And in the tourist bottom, tourists enterprises should reduce service workers, rectify the offering ability according to the quantity of tourists, and make them fit for modify of fluctuant require.

**5.2.2.** Tourists' claim aspect

Tourist enterprises should build effective information structure to make marketing investigate understand tourists' demand, predict tourists' quantity and prepare appropriate human and material μ resource. They should also offer service information in good time, make tourists

know when the peak-hour appears, establish service booking mechanism, bring on price policy, confine tourists' quantity in midseason and arouse tourists in off-season, bring on the tourists' divergence in scene by seasoned service workers. Enterprises should know the custom of tourists; ascertain the waiting time that tourists could accept. Anyway, make the balance between actual service ability and intending stress of treatment is the key issue for falling tourists' waiting era.

### 5.3 Sensitive queueing management of tourists

There are several kinds of issues that may reason dejected sentiment when tourists are waiting for queueing and the imperative issue is tourists' psychological issue. The reserve era may be taken as the realistic waiting era and mental waiting era. We bring on the queueing management in operation for the reducing of the practical waiting era. And we bring on the queueing management in tourists' discerning psychology is intended for reducing the mental waiting era by the mental response when the tourists are ranking in a queue.

It is investigated by Maister's study that discerning waiting is imperative than the real waiting. Therefore it is necessary to bring on the study to tourist's psychology when they are in queue, and recuperating their liking by some process.

**5.3.1.** The tourists' psychology when they are waiting for facility

In the process when tourists are waiting for service, they may feel waiting for longer when they have nothing to do rather than they have something to do. And they may have similar mood when they are waiting rather than they are in service. So the infinite waiting is longer than known and limited waiting, illogical waiting is felt longer than logical waiting, and unjust waiting is felt longer than pale waiting. Tourists will be hopeful for longer when the service rate and tourists' anticipation is higher. The tourists may have dissimilar felling because of their dissimilar requirements and time worth.

**5.3.2.** Existing methods of sensation management

The service rule when tourists are standing in a line must be exposed; pale and frank, and the queueing regulation must be approved first of all so that tourists will fulfil with when they are waiting for service. The Service group must strengthen the observation to make sure the tourists are waiting in a line reasonably.

It is necessary to build a quick information reactive mechanism that can update necessary information in good time. It can make tourists know how long they would wait well and truly, let them make mental preparation which may avoid mental averseness because of the eyeless waiting, and reduce the influence to travelling eminence.

In the process when tourists are standing in a line, the service group should arrange some positive and interesting activities that can divert their attention, and make them feel happy.

It is necessary to make a comfortable environment that can make tourists waiting for service in a happy mood, and reduce their mental waiting era.

It is also essential to make a tense, disciplined and quick working environment for service employees, and develop the competence of service group by reducing tourists' waiting era.

## 6 Conclusions

- Enhancing the structure's service strength can decrease the waiting time of tourists queueing. Thus their liking degree may be better.

- Optimality the number of service groups can also decrease the waiting time of tourists queueing. Thus their liking degree may be higher.

- Optimality the number of service groups can also decrease the waiting time of tourists queueing. Hence their liking degree may be improved.

## References

[1] **Source: World Travel and Tourism Council Data, 2015**

[2] U. Narayan Bhat. An Introduction to Queueing Theory e-ISBN: 978-0-8176-4725-4

[3] Chen Ling. Queueing Management Problem in Service Enterprises' Operation.2005, (7): 189-190,221-222.

[4] Wang Hui. Waiting and Repairing Strategy Research on Tourist Service Industry. Journal of Guilin Tourist Specialty School, 2001, (12): 65- 67,75.

[5] Chen Zhijia, Wang Xi, He Miao. The Large-scale Amusement Parks' Fast Channel Optimizes

The Model and The Simulation. Journal of Harbin Institute of Technology, 2005, 37 (9): 1261- 1263.

[6] Zhang Fushan. The tourists' liking: the attention focus. Beijing: Chinese Plan C, 2001.

[7] David Foster. Measuring Customer Liking In The Tourism Industry. Third International &Sixth National

[8] Zhang Yueli, Guo Jing. Service Marketing. Beijing: Chinese Finance Economics Publishing Company, 2002:285.

[9] Nan Jianfei, Zhao Lili. Research on Tourist Liking Degree's Evaluation aboout Tourist Scenic Zone. Market Modernization, 2006, (9): 48- 49.

[10] Chen Lirong, Suqin. Tourist Liking Degree Research Commentary of Our Country. Resource Development and Market, 2007, (3): 266- 268.

[11] Zhang Lingyun. Discuss The Queueing Theory's Application in Tourism Industry: Concurrently Analyze The Dining Room Waiters' Optimal Configuration. Social Scientist, 1988, (1): 7.

[12] Xu Jingsheng. Enhance The Service Quality to Strengthen Competitive Advantages. Traveling Journal, 2005, 20 (2): 5- 6.

[13] Simon. Interesting Queueing Psychology. Chinese Health Care Nutrition, 1999, (2): 22- 23.Wu Qizong. Operations Research. Beijing: Mechanical Industry Publishing Company, 2006.

[14] Nan Jianfei, Zhao Lili. The Diagnostic Analysis and The Countermeasure on Tourists' Draining Economics and Management 2002, (11): 68- 70