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# WAITING LINE PROBLEM FOR A NEW SERVICE ENTERPRISE AND ITS FRAMEWORK

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**KEYWORDS:** Waiting line,queue management,service.

## ABSTRACT
The waiting line or queue is a very complex issue for any business environment. Operation managers has to learn to solve the issues of queue management. Waiting line is very common at service sector, where customers wait at queue to receive service. This paper will discuss the various situations of industries and will try to study the common tools to sole the waiting line problem in the modern world.

## INTRODUCTION
In service economy, waiting line is a common problem. The objective of every business is to serve customer at very quick time. The service sector industry has to fill the gap in the waiting time of the customers. The more responsive it can be to customer, it will gain more customer satisfaction. In dynamic business environment, industries in the service sector tries to build competitive advantage in the way the customers are served. The operation manager has to find ways to solve various problems arising out of customer's satisfaction. The waiting line problem is not only problem for customers, it is problem even for employees. The issue of a single zerox machine where large number of employees are waiting to photo copy their papers can disrupt value added activities of their industry. A common situations that can occur in everyday life is a waiting line or queue. This are usually seen at bus stops, ticket booths. Doctor's clinic, bank counters, traffic lights and so on. It can be found at workshop where machines wait to be repaired. It can be applied to a situation where the arrival rate cannot be predicted.

## QUEUE MANAGEMENT
Queue occurs to both customers and employees.Queues are inevitable for any part of business and no capacity strategy can fully resolved queues issues.*Kaitz et al.*1991,said that waiting line improves dissatisfaction amongst customers.Davis and Vollman 1990,analysed that customers are dissatisfied with the service.Varoius authors have given different principles for waiting line.The following are the principles suggested by (1-8 by Maister 1985:9 by davis and Heineke 1994;and 10 by Jones and Peppiatt)

1. Occupied time is very shorter than unoccupied time.
2. The duration of pre-process wait is longer than in-process wait
3. Nervousness of customers makes customers feel wait longer
4. The waiting time for unknown waits are much longer than known waiting time
5. The causation of waiting time is longer than explained wait
6. Waiting queue should be on first come first serve
7. The customers may wait if the service is valuable for them
8. Single waiting may feels customers to wait longer.
9. The type of uncomfortable waiting can cause discomfort for the customer
10. People in new queue may find it longer to wait than frequent visitor

## PARAMETERS OF QUEUING THEORY
The components of queuing theory are

| Sl no | Components |
|---|---|
| 1 | The arrival rate for customers |
| 2 | The server rate |
| 3 | The number of servers. |

1.The arrival rate for customers
Customers arrival can be from finite or infinite population.The finite population can be a limited number of customers ready to use the service at specific time an form a line.The finite classification is important due to its probability of occurrence. Consider a company having six machines and one one repairmen.If a machine breaks

down,then the probability of other machine breakdown reduced to four.Infinite population is that where the populations are unlimited and are not predictable at waiting line.There are huge errors with infinite population waiting line.

2.The server rate

3.The number of servers.

Examples where queuing theory can be applied

| Situation | Customers | Service Facilities |
|---|---|---|
| Post office | Letters | Sorting out |
| Hospital | Patients | Doctors/Nurses/Rooms |
| Airport | Aircraft | Runaways |
| Petrol Pumps | Automobiles | Pumps/Passionel |
| Job Interview | Applicants | Interviewers |
| Admission Process | students | Staff/Employee |
| Super market | Arrival in queues | Checkout clerks at cash registers |
| Telephone company | Callers | Switching equipment to forward calls |
| Bank | Customer | Transactions handled by teller |

## STRUCTURE OF QUEUING SYSTEMS

The features of queuing systems are

1. Calling Population
2. Arrival process
3. Queue Configuration
4. Service process
5. Calling Population.

The characteristics of calling population are

1. Number of calling population
2. Arrival characteristics
3. Patern of arrival system

This is customer base who have different demands.Their demands are not similar.It cannot be homogenous and it can be different people.For some queue systems,the customer may be limited.The probability of future arrival may depends on the type of service they needs.The calling population can have different subpopulations.The limited or finite calling population is that if the customers arrival depends on the number of customers who are already in the queue to receive service.Infinite calling population is that if the customers arrival are independent of those already in the system.

**Queuing behaviour**

Customers can be of patient or impatient types.Bulking,jockeying and reneging are three types customers behavior who wants to receive fast service or leaves the queue.

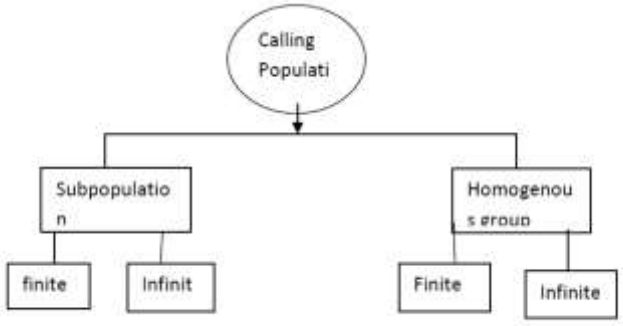


***Fig:Classification of Calling Populatation.***

**Arrival Process**

In a queue system It is always important to identify the waiting patterns for the customers and how these waiting patterns are arranged for the customers.Many studies had found that the distribution pattern of arrivalof interval is exponential distribution.Some of the intervals will be short while others will be long.

The arrival distribution can be found out by the following probability distribution

1. Poisson distribution
2. Binnomial distribution
3. Erlang distribution

The exponential distribution has a continuous probability density function given by

$$f(t) = \lambda e^{-\lambda t}$$

where $\lambda$ =Average interval rate for a particular period of interval
t=Time between interval
e=base of logarithm(2.718)
mean =$1/\lambda$
Variance =$1/\lambda^2$

**P o i s s o n D i s t r i b u t i o n**

The poisson distribution is given by
$f(n) = (\lambda t)e^{-\lambda t}/n!$. where n=1,2,3….
where $\lambda$ =Average interval rate for a particular period of interval
t=Time between interval
e=base of logarithm(2.718)
mean = $\lambda t$
Variance =$\lambda t$

## QUEUE CONFIGURATION

It is the arrangement of customers queues,location,their spatial requirements and effects on their behavior.

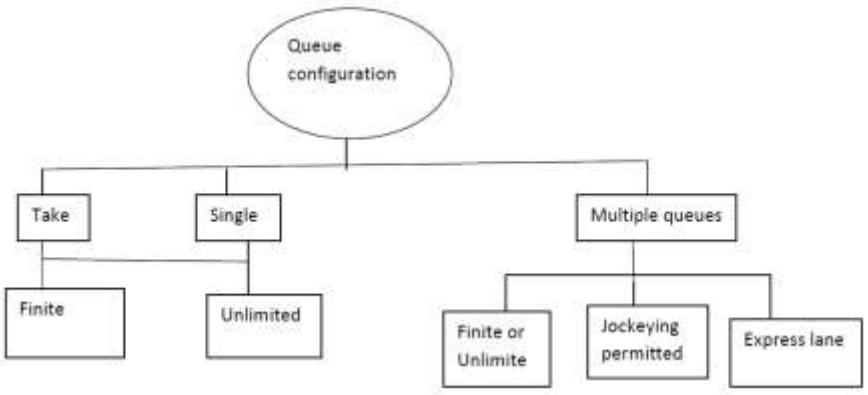


***Fig:Classification of queue configuration***

In queue configuration,it is decided by the customers which line the customers can join in queue.The advantage of queue configuration are

1. The type of service the sector wants to provide can be differentiated.Supermarket is an example of express lane.Shoppers will small demand may not form long queue.
2. The type of service it can provide can be dividied by labor for specific operations..
3. There is option for customers for selecting a particular server.
4. This the of configuration can satisfy customers.

The arrangement of banks, post office and amusement parks can heve the following advantage

1. The arrangement serves first come first serve(FCFS)
2. There is a single queue and it proves no anxiety for customers
3. Privacy is enchanced and protected in such kind of line due to is non immediate in transaction process.
4. More efficient in reducing time.

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Finite queue is a condition where there are inadequate to accommodate customers.These is referred to as finite queue.Restaurants with less inadequate facility can experience finite queue.

**QUEUE PROCESS**

It refers to number of queues and length of the queue.Numer of queues will depends on layout of service design and length of queue depends on operational situations.The situation which fails to accommodate more number of customers at a facility can be termed as finite source queue.Cinema halls,restaurants care example of finite source queue.Infinite source queue is that which can accommodate as many number of customers.Multiple queue has more advantage than single queue.

## QUEUE DISCLIPLINE

It is management policy to select next customer in the queue to serve the customer.The most popular service e disclipline are first come first serve(FCFS) and last come first serve(LCFC).Dynamic queue disclipline are based on the status of the customers at the queue.Dynamic queue are based on the following principle

a. Service in random order: Customers are selected randomly in the service system
b. Priority rule:Customers are served on the basis of priority rule
c. Pre-emptive priority(Emergency):In this rule,customers can enter in the service system as it enters the service.

4.Non Pre-emptive priority.The customers can allowed in the service system as soon as completition of ongoing service ends.

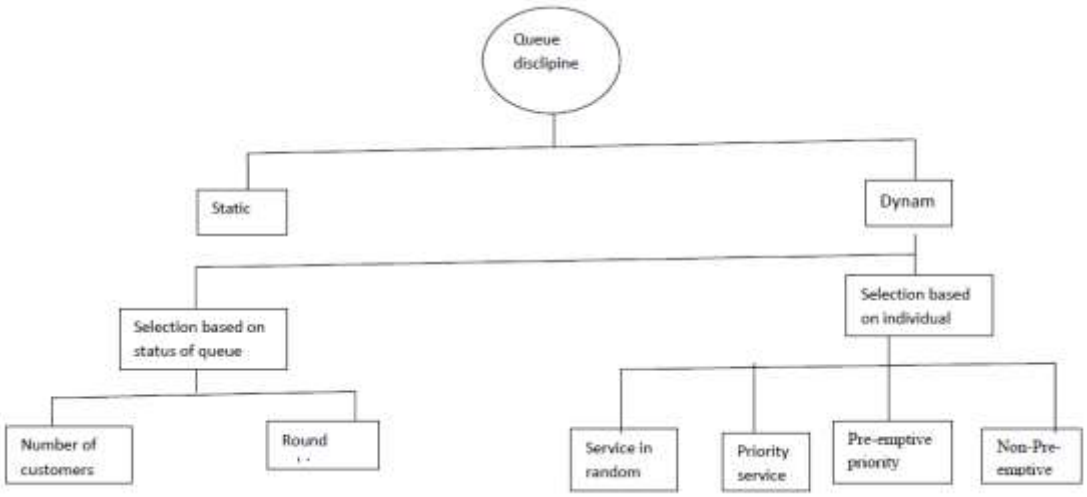


***Fig:Classification of Queue Disclipline***

**SERVICE PROCESS**

The process which contribute to service performance are called service process.
The characteristics of service process are

a. Arrangement of service facilities
b. Service time
c. Management policies
d. Server's behavior

Applications of queuing theory

1. Production control jobs
2. Routing problem
3. Airport runaway
4. Inventory control.

## ADVANTAGE OF QUEUING THEORY

It can make models for arrival pattern
It can solve waiting line problems

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## LIMITATIONS OF QUEUING THEORY

Models are not easy to understand but very complex Parameters of models may be unknown First come first serve is a bias in management theory Analysis is very difficult in multi-channel queue.

## CONCLUSION

The queuing theory tries to eliminate the queue line in the system for better service for the customers. The model is important for any industry to study the existing problem in the server system and still there prevails further research in the same field to explore different types of real life situation. There can a model for any kind of circumstance for server problem.

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