

## **THE IMPORTANCE OF PROPER MANAGEMENT OF WAITING LINES**

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### **Abstract**

*The waiting lines are a part of our existence, more or less. Nobody wants to spend time in a waiting line, but, in order to have access to certain goods or services, we agree to do it.*

*That's why the aim of this paper is, on one hand, to identify ways to reduce the cases in which waiting lines occur, but on the other hand, to find some helpful ideas to improve the quality of the time spent by customers in the waiting lines.*

**Keywords:** *services, waiting lines, queuing theory*

**JEL classification:** *L84 - Personal, Professional, and Business Services*

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### **1. Introduction**

In 1909, a Danish engineer named A. K. Erlang experimented with fluctuating demand in telephone traffic. Eight years later he published a report addressing the delays in automatic dialling equipment, and that research work can be considered the beginning of the Queuing theory. According to Houda, Taoufik and Hichem (2008), after the World War II, Erlang's early work was extended to more general problems and to business applications of waiting lines.

Inevitably, the waiting lines are part of our everyday life. Waiting in the queue can be a result of overcrowding, the manifestation of a too high request for a period of time or of an activity congestion. Whenever the demand is greater than the serving capacity of the service provider, a queue becomes inevitably.

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Waiting lines existence always gave headaches to managers. They face a dilemma created by the need to manage the business in such manner, to keep personnel costs as low as possible in conditions that do not occurs any customer dissatisfaction caused by waiting too long in the queue. Psychologically speaking, queues can create negative effects on service quality and customer satisfaction.

Even if we can speak about virtual queues formed without the actual presence of customers (when waiting, for example, to be called for periodic technical inspection of the car), the psychology of waiting lines applies especially where consumers are effectively queue waiting to be served.

## **2. Characteristics of a waiting line system**

The literature usually evokes three components of a waiting line system:

- a. arrivals or entries in the system
- b. the queue discipline or the queue itself
- c. the service facility.

**Arrivals or entries in the system** have three important characteristics:

a.1. the size of the group which are the inputs to the system - which can be unlimited (infinite) or limited (finite). The source group is considered infinite when at one point, only a small part of the group require these services, making difficult to predict the actual size of the group. The group is considered finite when we speak of a limited number of potential users, whose number is known or can be measured accurately.

a.2. the pattern of arrivals or entries in the system: customers can use a provider services randomly or after a predetermined pattern (e.g. one patient every 10 minutes). The inputs to the system are considered random when customers turn to services independent to each other, without being programmed to do so. The number of entries in the system can be approximated by the probability distribution known as the Poisson distribution, named after the French mathematician Siméon Denis Poisson (1781-1840) who first studied it. For any given time (e.g. 3 customers served per hour or 7 cars passing in one minute by a certain point), can be calculated a certain Poisson distribution, using the formula:

$$(1) \quad P(x) = \frac{e^{-\lambda} \lambda^x}{x!}$$

Where:

$P(x)$  = possibility of having  $x$  arrivals

$x$  = number of arrivals per unit of time

$\lambda$  = average arrival rate

$e \approx 2,71828182$

a.3. the arriving customer behavior - most systems assume that they are dealing with patient customers. Reality, however, faces us with situations in which customers refuse to wait in line, decide to come back later, or give up waiting after spending some time in the waiting line. Sometimes, when forming multiple waiting lines, customers tend to move from one queue to another, adopting a fickle behavior. These situations evoke once again the need to address this issue of waiting lines in a both scientific and practical way, in order to eliminate a possible discomfort that we can create to the customers.

**The queue discipline or the queue itself** is the second component of a waiting line system. There are situations that physical limit the queue length (i.e. the number of seats in the waiting room of a dental office). In most cases, however, the queue can be considered infinite, meaning that its size is not restricted in any way artificially (e.g. queues formed at a toll booth on the highway).

Very important is the queue discipline, generated by the rules that manage how the customers in the queue are served. The most common method is FIFO (first in, first out), sometimes also called FCFS (first come first served), meaning that customers are served in order of their arrival, but this rule cannot be applied in all cases. In the emergency department of a hospital there is a sorting system that takes into account not only the order of patients arrival, but also the type and the severity of their medical problems.

**The service facility** is the third component of a waiting line system. The system can be classified based on the number of service channels and the number of serving phases. A single channel serving system implies a single serving station, where the following customer is serviced by a single employee of the provider (e.g. an electricity bill collection point with a single cashier). If we have two or more cashiers, the system becomes a multi-channel one, because those waiting in line will be serviced by the available cashier when their turn comes.

In a single-phase system, the customer is served in one post then leaves the system with the problem solved (e.g. a fast-food restaurant where the one who takes your order, bring you the ordered food and cash you out). If solving the problem involves ordering to an employee, pay to another and take the food ordered from a third, we talk about a multiphase serving system.

As the flow of customers who are entering the system, the service time can be constant or randomly distributed over a shift, in the second case having relaxed periods alternating with busy periods.

The waiting line models helps managers to decide how to balance the higher costs given by a larger number of employees with the customer dissatisfaction they feel when they are served by a smaller number of employees. The analysis that can be performed can reveal systems performances expressed through indicators as:

- ✓ average time spent waiting in the queue;
- ✓ average queue length;
- ✓ average time needed to obtain the service (time spent in queue plus the actual time of service);
- ✓ average number of customers in the system;
- ✓ probability that employees do not have customers to serve in some periods of time;
- ✓ probability to have a certain number of customers in the system at a specific time.

### **3. Solutions regarding a proper management of a waiting line system**

There are several aspects of customer psychology that should be taken into consideration when generating a suitable solution for managing waiting lines.

First of all, it must be kept in mind that for a customer just waiting in a queue, the time spent there it seems much longer than when, in the same interval, he or she can do something. As noted by some authors (Sridhar, 2001), a practical but in the same time funny solution would to place a large mirror where the queue is formed, in which those who are waiting can study themselves, occupying their waiting time.

Another problem arises when, arrived in a row, the client has nothing to do while the employee solves the client request. It was found that it is more useful to try to involve the client, in one way or another, in solving the problem, because his/her time will pass easier.

Thirdly, it is very important if we can suggest to the client how much time will have to wait till he will be served. Waiting time will seem longer when the client has no idea how much time will have to wait, than in the situation in which he can estimate the waiting time.

Fourthly, providing the client with an explanation for the need to wait can create him a more comfortable condition. Waiting for unknown reasons can create the impression of a longer waiting period.

Fifthly, a proper treatment of the customer by the employee will reduce the discomfort caused by waiting. Conversely, if, after waiting in the queue, the customer is treated poorly, the discomfort created by waiting will be increased. Furthermore, if the waiting customer perceives the service as one of higher quality, he will show a greater willingness to wait for his turn.

Another important aspect is that customers waiting in lines for reasons that have a commensurable value (to raise money from one bank account, for example) are more willing to spend a longer time than those who wait for reasons that are hardly commensurable (to return borrowed books from a library).

Finally it should be noted that waiting alone will always seem longer than when you have waiting partners. This aspect should be treated carefully, because an irritated waiting partner may transmit this state to the one who initially was willing to wait quietly his turn.

All these psychological aspects can provide support to managers who are trying to find solutions to reduce the customers waiting time in order to avoid their discontent.

Among the actions that can help reduce waiting times in queues, we find:

- finding the maximum waiting time that a customer has to spend to get to be served;
- application of solutions suggested by waiting line theories to reduce waiting times: increasing customer service capacity, installation of a planning serving system, sorting clients according to different criteria, etc.;
- finding ways to create a pleasant ambience in the waiting place where the lines forms - creating a comfortable temperature, the possibility of waiting sitting in chairs, a relaxing ambiental sound, the opportunity to watch a TV program etc.

#### **4. Conclusions**

Services heterogeneity can create serious problems to provide a general solution available for managing waiting lines. The specificity of each type of service can give us additional solutions or can restrict us in finding a solution. At the same time, the experience, the skills, and the manager access to funds or other suitable means, can create him an advantage for the proper handling of this delicate problem, for the customer use and, by consequence, of the company use also.

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