

A Survey of Recent Results in Finite-Source Retrial Queues with Collisions and Impatient Customers in the Orbit*

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The goal of the paper is to study a finite-source retrial queuing system with collisions and customers' impatient behavior in the orbit. The server is not reliable, breakdown can happen either in busy or in idle states. The situation when an incoming customer from the orbit or from the source finds the server busy causes a collision and both requests are directed toward the orbit (including the customer under service, too). It is assumed that every request in the source is eligible to generate customers whenever the server is not working but these requests immediately get into the orbit. A customer after some waiting for the server to be served can depart from the orbit without fulfilling its service requirement these are the so-called impatient customers. In that case it goes back to the source. The source, service, retrial, impatience, operation and repair times are supposed to be independent of each other.

The novelty of the investigation is to carry out a sensitivity analysis comparing various distributions of impatient time of customers on the performance measures such as mean number of customers in the orbit, mean waiting time of an arbitrary customer, mean waiting time of customers who leave the system without service, probability of abandonment, server utilization, etc.

The aim of the present paper is to give a review of recent results on single server finite-source retrial queuing systems with impatient customers in the orbit. There are investigations when the server is reliable and there are models when the server is subject to random breakdowns and repairs depending on whether it is idle or busy. Tool supported, numerical, simulation and asymptotic methods are considered under the condition of unlimited growing number of sources. Several cases and examples are treated and the results of different approaches are compared to each other showing the advantages and disadvantages of the given method. In general we could prove that the steady-state distribution of the number of customers in the service facility can be approximated by a normal distribution with given mean and variance. Using asymptotic methods under certain conditions in steady-state the distribution of the sojourn time in the orbit and in the system can be approximated by a generalized exponential one. Furthermore, we guess that the distribution of the number of retrials until the successful service in the limit is geometrically distributed. By the help of stochastic simulation several systems are analyzed showing

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directions for further analytic investigations. Tables and Figures are collected to illustrate some special features of these systems.

Queueing systems with impatient customers can be found for example, in [1–3], [7]. Our recent results are in [4–6], [8, 9].

Keywords: finite-source queueing system, retrial queues, collisions, server breakdowns and repairs, impatient customers.

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