

Statistical analysis of a telephone call center: A queueing-science perspective”

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Abstract

A call center is a service network in which agents provide telephone-based services. Customers that seek such services may be delayed in tele-queues, which are invisible to them.

We report on an analysis of a unique record of call center operations. The data comprise a complete operational history of a small banking call center, call by call, over a full year. Taking the perspective of queueing theory, we decompose the service process into three fundamental components: arrivals, waiting times, and service durations. Each component involves different basic mathematical structures and requires a different style of statistical analysis. Some of the key empirical results will be sketched, along with descriptions of the varied techniques required.

Several statistical techniques are developed for analysis of the basic components. One of these is a test that a point process is a Poisson process. Another involves estimation of the mean function in a nonparametric regression with lognormal errors. A new graphical technique is introduced for nonparametric hazard rate estimation with censored data. Models are developed and implemented for forecasting of Poisson arrival rates.

In conclusion we survey how the characteristics deduced from the statistical analyses form the building blocks for theoretically interesting and practically useful mathematical models for call center opera-

tions. A copy of the submitted paper can be downloaded at <http://www.unc.edu/haipeng>.

Joint paper with Larry Brown, Noah Gans, Avi Mandelbaum, Anat Sakov, Sergey Zeltyn and Linda Zhao.