

Analysis of Service Time Distribution in A Call Center Network

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Abstract

In this study, an internet service provider's call center network is analyzed. The aim is to compare the effects of service time distribution on the system performance. Recent years studies state that lognormal distribution is an acceptable fit to service time of servers in call centers, but this study shows that triangular distribution can be a suitable fit to service time as well. The effects of these two distributions on the performance measures of the call center are compared with each other using a simulation-based approach. Further, Antithetic Variates method is used as a variance reduction technique. The simulation results indicate that there is not a significant difference between the performances of the call centers when the service times of the servers have a symmetric triangular or lognormal distribution.

Keywords; Call Center; Service Time; Distribution; Simulation.

1- Introduction

Telephone call center is a service network which provides telephone-based service for customers of a service provider. It plays an important role in the developed countries economics. Uchitelle (2002) states that 3.5 million employees work in this business which account for 2.5% of the workforce in the United States and 70% of business interactions are handled through call centers.

While having a high level of service quality is a main target for call centers, minimizing the operational cost is a concern for them. Brown et al. (2005) state that human resources account for more than 70% of the operating cost of call centers which force them to put high efforts to best utilize their agents (servers). Mathematical models have been used to increase the efficiency of these systems. Arrival rate and customer service time are the main parameters of these mathematical models. Arrival rate of customers and service time of agents are some primitives of a call center system and their behaviors are modeled by distribution functions. Where a Poisson distribution seems to be an acceptable assumption for arrival rate of customers in the literature, there are still some debates on the distribution of service duration (Kawanishi, 2008). Historically service durations have been modeled as exponential distributions. For example, Harris et al. (1987) found an acceptable fit of an exponential distribution for Internal Revenue Service (IRS) call centers. In another study, Kort (1983) finds the exponential distribution an adequate fit to service time. Robinson et al. (2010) develop an Erlang C model for the whole process of call center and compare this model with a simulation model. Lognormal is the other parametric distribution reported in applications which are acceptable for service time (Chlebus, 1997). Brown et al. (2005) state that their analysis for a small banking call center shows a significant fit to the lognormal distribution for service duration. In another study, Kawanishi (2008) indicates that lognormal is reported as service time distribution in some recent studies which contradicts with the exponential distribution for service time assumed by standard queuing theory.

This paper contains an analysis of an internet service provider's call center service time. The data include operational history of the call center over a 6 month period. Analysis of the service time of the servers shows a remarkable fit to a symmetric triangular distribution which has not been a reported distribution in the literature to the best knowledge of the authors. Triangular distribution of the service time brings up a question whether it