Advanced workforce management for effective customer services

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Abstract Because almost 60–80% of the total costs for operating a contact centre involve wage and benefit expenses for personnel, determining the optimal number of agents available is of great importance in call centre management. In modern call centres, working hours are divided into planning intervals with identical lengths. Each planning interval is typically assumed to be a homogeneous Poisson process in a steady state, and simple queuing models, such as Erlang-C (M/M/c), are often applied to determine the optimal staffing levels of the planning intervals. However, since the actual length of the planning interval in practice is relatively short, the basic assumption of staffing analysis could be violated. In this paper, we numerically analyze an M/M/c+M call centre’s behavior in a transient state. As a result, we can determine appropriate staffing levels of a call centre with short planning intervals which do not assume to be in a steady state.

Keywords Contact centre · Service quality · Operations research · Queuing theory · Work force management

1 Introduction

Call centres play an essential role in today’s business world, and are often the primary source of contacts for customers (Miciak and Desmarais 2001). Organizations in most industries take advantage of call centres to communicate with their customers and to increase customer satisfaction. Due to their importance, call centres have been fertile areas for operations management research. Furthermore, call centres are typical service systems which consist of many human workforces and technologically diverse devices, and they provide an excellent
motivational environment and training field for scientific service management (Mandelbaum and Zeltyn 2006).

As researchers have pointed out (Gans et al. 2002; Aksin et al. 2007), since a call centre’s largest expense generally comes from its staff of agents, it has been natural for traditional research to focus on the workforce angle of the operation, thus determining the optimal number of call centre agents and scheduling them have been of importance to call centre managers. Such tasks are called workforce management (WFM), and they have very often been supported by computer software, referred to as workforce management system (WFMS).

Most of the research, which has been conducted on call centre WFM, has focused on modeling the operations of a call centre on the basis of queuing theories, which have formed an important theoretical basis for call centre operations management literature (Brown et al. 2002; Gans et al. 2002; Aksin et al. 2007). In a queuing model of a call centre, the customers are callers, the servers are agents called customer service representatives (CSRs) or communication equipment, and queues are populated by callers that await service. Such queuing models have been widely adopted for call centre WFM, especially for evaluation of the performance of call centres and determination of the required staffing levels.

Since the arrival rate of incoming calls varies over the course of a day, the working hours of call centres have generally been divided into segments with identical lengths, called planning intervals. Then, each planning interval was assumed to have a Poisson process in a steady state, and staffing levels for the planning intervals could be determined by using the performance measures of queuing models in a steady state. The most widely used queuing model for staffing in a call centre has been the Erlang-C system (Green et al. 2001; Koole 2005).

However, since the length of the modern planning interval has become relatively short; typically 1 h, 30 min, or even 15 min, it could be impossible to take the steady state assumption. Furthermore, there could be uncompleted calls, which arrived in the previous intervals, which could affect the performance of current ones, but these have been ignored in staffing based on the steady state performance measures. In this paper, to overcome the shortcomings of previous research, we devise an M/M/c+M call centre with short planning intervals. To determine staffing levels of this call centre, its behavior in a transient state is numerically analyzed by applying the concept of dynamic staffing.

The remainder of this paper is organized as follows: In Sect. 2, we present the research background for this paper and a literature review on call centre operations management. In Sect. 3, we discuss the features of current call centres which could degrade the performance of steady-state-based staffing, and describe a staffing process of an M/M/c+M call centre with short planning intervals, which do not assume a steady state. It exploits the idea of dynamic staffing. In Sect. 4, the results of our staffing method are numerically compared with those of staffing based on the steady state. Finally, concluding remarks and direction of further research are offered in Sect. 5.

2 Literature review

Call centres have been a rewarding area for operations management researchers, who have studied several topics, including forecasting, capacity planning, queuing, and personnel scheduling. In addition, as telecommunication and information technology have advanced over the past several years, the operational challenges faced by call centre managers have become more complicated as a result. Issues associated with human resources management, sales, and marketing have become increasingly more relevant to call centre operations and