Designing Robust Service Systems: Extending the Erlang A Model and Its Staffing Rule

Abstract: All service facilities, from small restaurants to large call centers, are concerned about the quality of service (QoS) they provide to their customers. However, capacity planning for service systems is often difficult, for example, due to impatient customers who are likely to abandon a facility when the system is congested. An important, yet simple rule-of-thumb to identify the ideal staffing level that satisfies a desired QoS level is the square-root staffing rule, derived from the Erlang A model. However, to apply the rule, we need to assume that arrival/service rates are relatively stable throughout the planning period. This may not be true when managers can control the arrival rate and/or the service rate during congestion. We call such measures congestion-based control (CBC) schemes. We derive non-asymptotic and asymptotic representations of performance indicators for an Erlang A model under CBC.

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Alan's research interests include inventory theory (especially ATO systems, systems with capacities, alternate supply options and/or perishable products), energy, service systems, computer science, stochastic processes and queueing theory. He sits on the editorial boards of Management Science, Operations Research, M&SOM, MMOR, and QUESTA. He has completed consulting projects with Amazon, Caterpillar, John Deere, The American Red Cross, and The Vera Institute of Justice. He currently teaches MBA courses in Quality and Sustainable Operations.

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