



# The OM Triangle

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**Abstract.** A key contribution of OR/MS models is to gain insights into trade-offs facing operations managers. One such trade-off involves capacity, inventory, and variability: while the firm would like to tolerate high levels of variability and run at full capacity utilization with virtually no inventory, this is not plausible. The standard G/G/1 queueing model is used to illustrate and gain insight into the trade-off between these three competing goals. In cases where better information can be used to reduce the variability in services or in arrivals, this insight can be expressed as an inter-relationship between capacity, inventory, and the third parameter of information (rather than variability). Adopting the terminology of Lovejoy (1998), this inter-relationship is referred to as the OM triangle. As discussed herein, it is the manager's job to find her firm's optimal position with regard to the OM triangle.

**Keywords:** queueing theory, capacity, inventory, waiting time, lead time, information, tradeoff.

## The OM Triangle: Instructor's Note

### 1. Introduction

Many popular texts in operations management lack simple examples that illustrate the tradeoff between capacity, inventory, and variability. This key insight is derived herein from queueing theory; more specifically, from the G/G/1 queueing model.

While queueing theory provides sound theoretical background for the derivation of the inter-relationship between these three parameters, the goal of this note is not to teach queueing theory. Instead, it is to bring out qualitative insights that can be used as a guide in managerial decision making. Students should not get lost in the calculations and thereby miss the insights that the theory has to offer. One of these insights is that capacity, inventory, and variability reduction are, in a sense, substitutes. For example, if you reduce variability, you can get by with less capacity and/or less inventory.

In a queueing setting, variability can be found in arrivals and/or in services. These two types of variability can be expressed, for example, by the coefficients of variation in interarrival times and in service times.

In some cases, variability in arrivals and in services can be reduced by the judicious acquisition and use of *information* (broadly defined). For example, rather than taking all patients as walk-ins, a doctor's office might get