



# Empirical simulation studies in operations management: context, trends, and research opportunities

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## Abstract

This study investigates, published simulation studies in operations management (OM) that are empirically based. The results of the study are based on an exhaustive search of twenty leading operations management journals over the period from 1970 to 2000. Approximately, 600 published simulation studies in operations management were identified, but only 85 of these were subsequently identified as being empirical in nature. The 85 articles were next classified into one of 17 categories. Results by journal, topic, time period, and combinations of these factors are reported. Finally, opportunities for future research are discussed.

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## 1. Introduction

Computer simulation is one of the most widely used research methodologies employed in the field of operations management (OM). For example, [Amoako-Gympah and Meredith \(1989\)](#) found that of the 363 articles published between 1982 and 1987 included in their survey of OM research, that modeling was the most widely used research approach accounting for 38.0% of the articles followed by simulation, which represented another 30.8% of the articles. The authors also noted that the simulation studies tended to use randomly generated data and real-world data was only used in a few cases.

More recently, [Pannirselvam et al. \(1999\)](#) surveyed the OM literature to investigate the issue of an OM research agenda. Based on the OM papers published in seven targeted journals between 1992 and 1997 it was concluded that computer simulation was the second most commonly used methodology, behind optimization. More specifically, computer simulation was the primary research methodology employed in approximately 18% of the published articles surveyed. Based on the results of the study, [Pannirselvam et al. \(1999\)](#) appeared to be in agreement with [Meredith et al. \(1989\)](#) assertion that OM research tends to be artificial in nature due to its reliance on modeling as opposed to empirical research. We comment that while simulation studies are typically associated with modeling research, the flexibility of the simulation methodology readily lends itself to modeling real world scenarios.

As opposed to previous studies that have investigated published research in OM across a variety of topics and methodologies, the purpose of this study

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is to focus on the use of a specific research methodology, computer simulation, in operations management research. Specifically, we examine those simulation studies that are empirical in nature, that is they either are modeled to represent specific real situations/environments or data from real situations are used as a basis for setting the levels of key parameters in the simulation study. Our goal is to identify and evaluate past research trends in this area, determine if any gaps exist in this literature, and then based on this insight uncover opportunities for future research.

This paper is organized as follows. In the Section 2, relevant research is reviewed. This is followed by a discussion of the research methodology employed in this study. Next, the results from this study are presented, showing the categorization of empirically-based simulation studies over the 30-year period studied. Finally, the paper is concluded and avenues for future research are discussed.

## 2. Literature review

Over the last couple of decades a number of papers have investigated issues related to research in OM. This research has addressed OM research from a general perspective (Buffa, 1980; Meredith et al., 1989) offered frameworks for classifying OM research (Chase, 1980; Mabert, 1982; Amoako-Gympah and Meredith, 1989; Pannirselvam et al., 1999; Prasad and Babbar, 2000) and suggested agendas for future research (Miller and Graham, 1981).

Table 1 summarizes the previous studies that have focused on investigating published research in the field of OM. A review of this table suggests that the study reported here extends the literature in four important ways. First, the length of the study is substantially

longer than those of earlier studies, thus providing an enhanced longitudinal view. Second, this study considered a larger number of journals than most of the earlier studies (the one exception being Prasad and Babbar, 2000 where, a number of managerial and international journals were also included). Third, this is the first study to investigate how a specific research methodology has been applied in the field of OM over time, thus allowing a trend analysis. We believe, a study focusing specifically on empirically-based simulation in OM is justified, given that in both the Amoako-Gympah et al. (1989) and Pannirselvam et al. (1999) studies, simulation was found to be the second most commonly used research methodology in OM. Finally, to our knowledge, this is the first study that specifically limits its scope to OM research that is empirical in nature. This focus was chosen to identify trends, gaps, and research opportunities regarding the use of simulation in empirical OM studies.

## 3. Research methodology

Twenty journals were included in this study and are listed in Table 2. With a couple of minor changes, these journals are the same set of journals included in Barman et al. (2001) study investigating the relevance and quality of OM journals. One change was the removal of the *Academy of Management Journal* and the *Academy of Management Review* from the list as they were not viewed as being outlets for simulation studies in OM. The other change included adding *IEEE Transactions on Engineering Management* to the list.

As a first cut, our goal was to identify all articles published in the set of 20 journals between 1970 and 2000 that used computer simulation to investigate an

Table 1  
Studies investigating published research in OM

Study	Number of journals surveyed	Duration of study (years)	Scope of study	Number of articles reviewed
Chase (1980)	4	2	OM field	134
Mabert (1982)	8	6	Service OM	86
Amoako-Gympah and Meredith, 1989	6	6	OM field	363
Pannirselvam et al. (1999)	7	6	OM field	1754
Prasad and Babbar, 2000	28	12	International OM	548
Shafer and Smunt (Study reported here)	20	31	Empirical simulation research in OM	85

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