Survey Research in Operations Management: Historical Analyses

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Abstract

This paper examines 431 survey research articles in operations management (OM), published between 1995 and 2004. Six OM journals are included. We reflect upon the state and evolution of survey research across a decade time span and the contribution of OM journals that have published these studies.

Keywords: Survey research; OM history; Methodology

1. Introduction

OM scholars, such as Hill et al. [10] and Filippini [7], often point to 1980 as a critical junction in the modern development of the OM discipline. Before 1980, core issues and problems in OM had traditionally been addressed via modeling-based research using either optimization or simulation methodologies, almost to the point of exclusivity of other research approaches. However, in 1980, the OM discipline began to undergo fundamental changes that had resulted directly from self-assessments of research needs and agendas that can be found in Buffa [4], Chases [5], Miller and Graham [13], Sullivan[17], and Voss [20]. Sullivan [17, p.214] recommended that OM researchers undertake research approaches "frequented by organizational behavior and marketing specialists" in order study to management-oriented and more "macro-oriented" OM issues and problems addressed by Buffa [4] and Chases [5], respectively. These realizations eventually led to a conclusion by Swamidass [18, p.794] that "the scope of OM can not be captured and explained in its entirety by purely deductive tools such as mathematics and its extensions such as operations research or statistics".

Since 1980, the OM discipline has witnessed increased deployment of empirical research designs, particularly survey research, to understand better such issues as manufacturing strategy, manufacturing flexibility, just-in-time manufacturing, quality management, etc. In general, OM researchers, in light of their traditional training in optimization-based and simulation-based research methodologies, have demonstrated remarkable progress in comprehending the complexities of designing and executing empirical research. Rungtusanatham [14, p.10] commented that this progress "is evidenced not only by the quantity, but also the quality and sophistication of the research endeavors that have been completed".

The purpose of this is to provide a comprehensive assessment of OM survey research over last decade. The rest paper is organized as follows. Section 2 begins by reviewing other evaluative articles similar to ours and demonstrate how we build on these previous works. There then follows Section 3 discussing methodological issues. Section 4 provides the results of our analyses. The results will delineate the historical trends of OM survey research, as well as the contributions that different OM journals have made in developing and promoting survey research. Finally, Section 5 ends with a general discussion and implications for future research.

2. Literature review

In 1997, the International Journal of Operations & Production Management (IJOPM) published a collection of articles on survey research. One of the papers in that issue [7] traced the evolution of OM topics and research approaches over the last 2 decades by analyzing the 244 papers published in the Proceedings of the Annual Meeting of the Decision Sciences Institute, 1996, in terms of research content and methods. The insights were compared to other insights developed from similar analyses of the 1986 and 1987 proceedings of the same conference [1]. In his conclusions, Filippini brought attention to the need for improving the quality of survey research in OM. In particular, he encouraged the development of reliable and valid measures and the incorporation of multiple variables. In this same special issue, Collins and Cordon [6] sought to identify and discuss methodological issues surrounding the design and administration of large-scale surveys. Choosing manufacturing strategy as their content focus, Collins and Cordon [6] compared and contrasted the design and execution of two completed survey-based research studies that led to insights concerning sample selection, respondent preparation, bias, etc.

Malhotra and Grover [11], seeking to provide a normative perspective on what constitutes "good" survey research, developed a list of 17 ideal survey research attributes. These attributes touched upon issues such as unit of analysis, triangulation of data sources, psychometric assessments of multiple-item measurement scales, sampling frame and strategies, response rates and bias, and substantive analytical approaches and statistical power. Malhotra and Grover [11] then applied these 17 attributes to evaluate 25 survey-based OM papers from four journals between 1990 and 1995. This evaluation led the authors to suggest the need for OM researchers to build on existing research, the importance of theory-driven survey research, the use of triangulation, the need to conduct formal assessments of reliability and construct validity, the use of existing measures, the application of confirmatory methods for data analysis, etc.

Finally, Hensley [9] focused specifically on the development and use of reliable and valid measurement scales in OM research. Six studies were reviewed in terms of the approaches to the development and validation of multiple-item measurement scales. Strengths and weaknesses of these six studies were identified and discussed in order to help future researchers better understand the various issues involved in creating and/or adapting existing measurement scales for OM research.

While the fundamental purpose of our paper parallels that of these similarly published papers, our study brings in a decidedly historical perspective. For instance, Malhotra and Grover [11] focused on 25 published survey research studies in OM between 1990 and 1995. Collins and Cordon [6] compared and contrasted two survey research studies on manufacturing strategy. Filippini [7] examined articles from proceedings of an annual conference, and Hensley [9] reviewed and discussed six papers that reported narrowly on the development of multiple-item measurement scales.

In order to build on these studies and to frame the study in a more historical context, we expand the number of articles considered, as well as the time period under analysis. We include a more exhaustive set of survey research articles published (431 articles) and expand the journal list to six major journals. Furthermore, we chose to cover a span of 10 years between 1995 and 2004. As a way of building on past studies, we repeat some of the same analyses that earlier scholars conduct (e.g. measurement issues, topical issues, data analysis approaches, etc.), but we do that in an expand context. In addition, we try to highlight different contributions that different journals have made in the evolution and development of OM survey research.

3. Methodology

In order to provide a comprehensive historical perspective on OM survey research, we address issues of time horizon, journal selection, article selection, coding, and analysis.

3.1 Time Horizon

We chose to anchor our assessment period of the past decade during 1995 - 2004, a 10-year time horizon.

3.2 Journal Selection

We looked for all OM journals that have been known to publish empirical studies, in particular survey papers. We first selected Decision Sciences (DS), Journal of Operations Management (JOM), and Management Science (MS) because previous studies have consistently ranked these journals in the upper echelon. Saladin [15], for example, ranked JOM, MS, and DS in that order with respect to quality of journal and appropriateness. Barman et al. [3] Classified these three journals in the first three of the six groupings in terms of relevance and in the first of the five groupings in terms of quality. In Vokurka [19], MS, DS, and JOM were ranked first, second, and fifth, respectively, out of 25 journals. Goh et al. [8] considered these three journals to be in the "Elite" grouping. Soteriou et al. [16] reported that European OM scholars placed JOM and MS in the top five groupings in terms of both relevance and quality.

We included three other journals in our review and evaluation—International Journal of Operations and Production Management (IJOPM), International Journal of Production Research (IJPR), Production and Operations Management (POM). In Goh et al. [8], IJOPM and IJPR had the same "Elite" status as DS, JOM, and MS. Soteriou [16] pointed out that European OM scholars placed both IJOPM and IJPR in the top five groupings in terms of both relevance and quality. POM is included because it is generally regarded as an important emerging journal for OM research; for instance, in a recent replication study, Barman et al. [2] ranked *POM* as second after *JOM* in terms of relevance in OM research.

3.3 Article Selection

We applied two criteria to select articles from all potential articles published in the six journals noted above. First, the selected articles should address a problem or an issue that falls under the OM research agenda, especially since DS and MS also publishes research that falls outside of OM (e.g. finance, information systems, and organizational theory). Second, the selected articles were to categorize into 17 OM topic areas. While for most articles, this was straightforward; for some articles that addressed relatively new topic areas within OM, such as new product development and supply chain management, the decision was more of a challenge. Table 1 shows the emerging OM topics and where they were included in this study. Some of the new sub-topics could be included under more than one traditional OM main topic areas depending on the content of the article. Table 1 indicates the original OM topic under which the emerging topics were counted.

We also excluded several articles that did not contain sufficient information about four critical aspects in the execution of the survey methodology (i.e. discussion of sampling strategy, specification of the unit of analysis, assessment of measurement quality, and assessment of common methods/source variance). Additionally, we also did not consider a number of articles that merely described the extent of usage of OM concepts and techniques, background descriptive characteristics of production managers, or characteristics of manufacturing in a particular industrial sector in a country.

Table 1 here

3.4 Coding

We coded all 431 OM survey articles to obtain regarding several information evaluation dimensions-journal outlet, year of publication, main topic of article. The coding was completed on an individual basis, such that one member of the research team would be responsible for at least one journal. One individual research team member then double-checked the data coding for the entire set of articles that were included in our study, correcting for missing or incomplete information. We conducted random checks for inter-rater reliability, and we typically obtained about 85% agreement, which gave us reasonable assurance that we were being consistent in our coding activities.

3.5 Analysis

The purpose of this paper, being descriptive and inductive in nature, is not conducive to statistical methodologies for deductive hypothesis testing. Instead, we engaged in trend and pattern analyses in order to shed greater understanding on the development and evolution of survey research in OM and to identify potential areas for improvement. We present these analytical results in the form of tables and graphs.

4. Published research results

4.1 Topics

We identified 431 articles in the six journals for the period of 1995–2004 as those with a true OM focus. Table 2 presents a matrix of operations management research topics by journal.

An examination of Table 2 shows that aggregate planning (15.47%), inventory control (13.35%) and distribution (12.71%), accounted for almost 42% of the published research in the journals we surveyed from 1995 through 2004. Quality, capacity planning, and process design for 12.29%, 8.47% and 7.84%, respectively. Below these six topics there was a rapid decline in the volume attributed to a single topic. The other 11 topics comprise the remaining 29.87%.

Table 2 here

The last two columns in Table 2 also show the percentage of these topics for the periods 1995–1999 and 2000–2004. Some changes in published OM research topics have occurred between these two time periods. However, the relative frequency of aggregate planning has rapidly decreased during these periods. There has also been a slight drop in the frequency of inventory control as a research topic. The frequency of process design as a research topic has dropped steadily over the two periods and its ranking has fallen from 3 in 1995–1999 to 6 in 2000–2004. The relative frequencies of distribution, quality and capacity planning have each increased in the two time periods. While the ranking of capacity planning has been steady through the two periods, distribution has gone up in ranking during these time periods.

There are some possible explanations for the continued importance of aggregate planning today. Even for this mature topic area, there are many new environmental circumstances that keep the subject fresh. These new concerns include an increased focus on time-based competition and flexibility. Attention to customer service, product or service flexibility and time sensitive delivery are important for both manufacturing and service organizations in today's marketplace.

In much the same manner, inventory management is an area of traditional study that is no longer of tactical importance only. It assumes strategic importance in terms of new competitive approaches such as work-in-process (WIP) inventory cost reductions and finished goods buffer stocks. The development and success of just-in-time methods in Japan have lead to an increased focus on inventory and materials management, and the use of shop floor control techniques as a competitive weapon. Table 3 presents a matrix of research methods by journal. This table provides information about the relative importance of different research methodologies to the field of operations management. The table includes not only the single methods used, but also the methods used in combination. We present the single research methods first and then the multiple methods. Both groups of methods are sorted by the frequency of occurrence.

Table 3 here

The modeling category in Table 3 includes a number of distinct sub-categories: mathematical programming, calculus, which includes mathematical models with closed-form solutions, and statistical models. This extensive number of sub-categories helps to explain why theoretical/conceptual (TC) are the most highly represented research method with a frequency of occurrence of 41.76% of the methods applied to operations management research, include all models that are not of a mathematical nature. These include models that are best represented as some form of chart, graph, flow chart or descriptive models.

TC & modeling is the second most frequently used research method, accounting for about 25% of the methods used. TC & simulation methods accounted for about 12% of the articles surveyed. Case study, field study and laboratory experiment are forms of empirical research, don't include those in this paper.

Table 3 also shows the percentage of counts in each method separately for 1995–1999 and 2000–2004. Furthermore TC models and TC & modeling are the most frequently used methods in each of the two periods, their relative frequencies have improved. The use of TC & simulation and modeling & simulation has declined during the two time periods. This decline, however, is not as high as one might expect based on the agenda recommendations published in previous decades. As [12] indicated, OM research still remains primarily artificial in nature in the sense that it still involves more modeling than empirical research.

4.3 Topics by Method

Table 4 presents a matrix of OM topic areas by solution methods. It is not surprising, given the examination of Tables 2 and 3, that the top left-hand corner of this table is so heavily weighted. TC models are the most commonly used methods to study aggregate planning, distribution, and quality. Table 4 also shows that TC models are applicable to almost all OM topics. Research in inventory control uses TC & modeling, TC models, and TC & simulation most frequently. TC models are clearly the most popular method for research in capacity planning followed by TC & modeling. TC models are the most widely used method for research in process design.

4.2 Research Methods

4.4 Journals Profiled

An examination of Tables 2 and 3 gives a profile of the OM topics and research methodologies favored by the journals in this review. Table 2 shows that about 56% of the papers surveyed appeared in two journals, IJPR and JOM. Fifteen different topics appeared in IJPR, 14 in JOM, 13 in DS, 13 in IJOPM, 13 in POM, and 10 in MS.

IJPR had the highest number of operations management articles. Shop floor control, aggregate planning and inventory control are the dominant topics of interest in IJPR. However, this journal does publish articles in a wide spectrum of OM topics. IJPR appears to be a good outlet for quality and process design manuscripts, as 20% of the journal's topic coverage is in these two areas.

A large number of the articles in JOM address the traditional topics of distribution, quality, and process design. However, JOM seems to be a good outlet for research in aggregate planning with almost 25% of the total articles in this area. IJPR, MS, and POM account for about 13%, 11%, and 8%, respectively, of the topics counted from 1995–2004. Publications in these three journals are heavily concentrated in distribution and inventory control.

JOM accounts for about 23% of the topic counts. JOM seems to favor manuscripts on aggregate planning, with about 23% of its articles representing these topic areas. POM accounts for slightly more than 16% of the topics counted in the 10-year time period. A large proportion of its articles are based on research in the distribution area. However, POM also has a number of articles that are based on research in inventory control and quality.

Of the journals we reviewed, IJOPM and POM were the only journals in the list to act as significant outlets for OM strategy and quality articles. JOM shows a significant interest in strategy. The relatively high frequency of quality and strategy articles in these journals is a result of some special issues focusing on quality and strategy. However, these special issues reflect the growing need for research in these two areas and the journals' reaction to this need. Much of the work published in these two areas within these journals is empirical research.

As shown in Table 3, IJPR and JOM show the most balance across all the methodology categories found in this study. The remaining journals emphasize the top two methods of TC models and TC & modeling. Of the six journals, IJPR has an interesting profile. Even though there is a clear preference for modeling & simulation, survey research, and modeling, this journal still places significant emphasis on TC models and TC & modeling.

4.5 Trends in Cooperative Research

Research that integrates different OM topics might benefit from the incorporation of multiple viewpoints. Team based research is one way to ensure that multiple viewpoints are included in the research agenda. We classified the journal articles surveyed in this research by the number of authors of an article. Table 5 presents the number of articles that were single authored and multiple authored for each journal we surveyed. The counts are separated into two time periods: 1995–1999 and 2000–2004. As a whole, the total percentage of articles that have multiple authors has gone up slightly between the two time periods. This increase is true for three of the six journals included in the study. DS, MS, and POM show a slight drop in percentage of multiple author articles between the two time periods. This drop of MS and POM, however, is a result of a very slight increase in the number of single author papers. The last two rows of Table 5 show the total increase in multiple authored articles.

Table 5 here

5. Conclusions

The last decade have evidenced remarkable progress in the quantity and quality of theoretical research in OM. Survey research in OM, in particular, has blossomed, becoming increasingly accepted as a legitimate methodology for understanding the core issues and problems that our discipline faces. In our review, we have theoretically substantiated this growth and have demonstrated the improving nature and the increasing rigor of OM survey research. However, we must acknowledge that opportunities for improvement still exist-opportunities that, we believe, can propel our research and results into a greater arena of acceptance both within and beyond the boundaries of the OM discipline. The conclusions of this paper have the following description. Among 431 OM articles on survey research, aggregate planning is the most highly frequently of occurrence of 15.47% of the articles surveyed to operation management research. Inventory control is the second most frequently of the topic area, accounting of occurrence of 13.35% of the articles surveyed. Distribution accounted for about 13% of the articles surveyed. Theoretical/conceptual (TC) is the most highly represented research method with a frequency of occurrence of 41.76% of the methods applied to operations management research. TC & modeling is the second most frequently used research method, accounting for about 25% of the method used. TC & simulation methods accounted for about 12% of the articles surveyed. TC models are the most commonly used methods to study aggregate planning, distribution, and quality. The number of authors by articles, total percentage of articles that have multiple authors has gone up slightly between the two time periods.

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Table 1 17 OM topic areas

#	Emerging OM topics	Original OM topics
1		inventory control
2	some new product development	scheduling
3	technology choice	process design
4		aggregate planning
5		services
6	some new product development	quality
7	new product development, technology management, some supply chain management, environmental concerns	strategy
8		capacity planning
9		maintenance
10	some supply chain management	purchasing
11		facility layout
12		forecasting
13		project management
14		quality of work life
15		facility location
16	some supply chain management	distribution
17		work measurement

Topical classification c	of operativ	ons mana	gement re	search												
Journal:		SC	OUI	Mdu	ICI	R	Oſ	M	Μ	S	PO	M	Totals	%	%	%
Years:	95-99	00-04	95-99	00-04	95-99	00-04	95-99	00-04	95-99	00-04	95-99	00-04	95-	-04	95-99	00-04
Topic Area:																
Aggregate Planning	11	3	0	7	10	6	15	6	0	ю	1	5	73	15.47	22.02	11.84
Inventory Control	ю	4	0	2	15	19	2	1	2	4	2	6	63	13.35	14.29	12.83
Distribution	5	9	0	3	0	б	7	12	3	4	0	22	60	12.71	5.95	16.45
Quality	9	2	0	5	3	13	4	10	3	1	1	10	58	12.29	10.12	13.49
Capacity Planning	4	1	0	3	L	11	2	б	0	2	0	L	40	8.47	7.74	8.88
Process Design	7	5	0	1	4	12	9	ю	4	0	1	7	37	7.84	10.12	6.58
Strategy	2	2	0	8	3	1	4	1	1	0	1	5	28	5.93	6.55	5.59
Services	0	0	0	1	8	8	0	9	0	1	0	1	25	5.30	4.76	5.59
Scheduling	1	2	0	1	ю	ю	4	1	1	0	1	S	22	4.66	5.95	3.95
Project Management	2	0	0	1	4	8	2	3	0	0	0	0	20	4.24	4.76	3.95
Purchasing	1	1	0	1	0	0	7	ю	0	0	0	б	11	2.33	1.79	2.63
Work Measurement	0	0	0	1	0	2	1	9	0	0	0	0	10	2.12	0.60	2.96
Facility Location	1	1	0	0	2	3	0	0	0	0	0	1	8	1.69	1.79	1.64
Forecasting	0	7	0	1	0	1	1	1	0	0	0	1	٢	1.48	0.60	1.97
Facility Layout	0	0	0	0	7	0	1	1	1	0	0	0	5	1.06	2.38	0.33
Quality of Work Life	0	0	0	0	1	2	0	0	0	0	0	0	3	0.64	0.60	0.66
Maintenance	0	1	0	0	0	0	0	0	0	0	0	1	2	0.42	0.00	0.66
Topic Counts	38	27	0	35	62	95	46	60	15	15	7	72	472	100.00	100.00	100.00
Number of articles	35	21	0	32	56	06	44	53	14	13	L	99	431			
Total Percentages	8.1	5.7	0.0	7.4	13.1	20.1	9.7	12.7	3.2	3.2	1.5	15.3	100	_		

Journal:	Ď	S	OfI	M	ITI	PR	Oſ	M	W	S	PO	M	Totals	%	%	%
Years:	95-99	00-04	95-99	00-04	95-99	00-04	95-99	00-04	95-99	00-04	95-99	00-04	-36	04	95-99	00-04
Methodology:																
Theoretical/Conceptual (TC)	12	10	0	20	10	15	31	30	S	1	ю	43	180	41.76	39.10	43.27
Jurvey	7	0	0	7	0	ю	ю	S	0	б	0	7	20	4.64	3.21	5.45
Modeling	1	2	0	0	1	9	0	0	2	2	0	1	15	3.48	2.56	4.00
Simulation	4	0	0	0	б	7	0	0	1	0	0	0	15	3.48	5.13	2.55
rC & Modeling	8	4	0	5	20	26	4	13	5	7	2	14	108	25.06	25.00	25.09
rC & Simulation	4	ю	0	б	11	18	4	3	0	0	2	4	52	12.06	13.46	11.27
Modeling & Simulation	4	1	0	1	5	10	0	0	1	0	0	1	23	5.34	6.41	4.73
rC & Survey	0	1	0	1	3	3	0	2	0	0	0	1	11	2.55	1.92	2.91
Modeling & Survey	0	0	0	0	2	0	2	0	0	0	0	0	4	0.93	2.56	0.00
simulation & Survey	0	0	0	0	1	7	0	0	0	0	0	0	б	0.70	0.64	0.73
Article Totals	35	21	0	32	56	90	44	53	14	13	L	99	431	100.00	100.00	100.00
Articles Percentages	8.1	4.9	0.0	7.4	13.0	20.9	10.2	12.3	3.2	3.0	1.6	15.3	100			

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Methodologies:	Theoretical/ Conceptual (TC)	TC & Modeling	TC & Simulation	Modeling & Simulation	Survey	Modeling	Simulation	TC & Survey	Modeling & Survey	Simulation & Survey	Total
Topic Area:											
Aggregate Planning	31	14	4	5	8	0	2	9	3	0	73
Inventory Control	13	25	10	8	0	5	1	0	1	0	63
Distribution	32	18	5	1	1	0	1	2	0	0	60
Quality	26	15	3	2	5	1	2	2	0	2	58
Capacity Planning	14	12	8	0	0	3	2	0	0	1	40
Process Design	11	6	10	1	0	2	4	0	0	0	37
Strategy	16	5	1	0	3	1	1	1	0	0	28
Services	9	8	1	4	1	3	0	0	0	7	25
Scheduling	16	2	4	0	0	0	0	0	0	0	22
Project Management	7	9	5	1	0	0	1	0	0	0	20
Purchasing	8	1	0	1	0	0	0	1	0	0	11
Work Measurement	5	1	1	1	1	0	0	1	0	0	10
Facility Location	1	1	3	1	0	0	2	0	0	0	8
Forecasting	2	2	1	0	1	1	0	0	0	0	L
Facility Layout	1	3	1	0	0	0	0	0	0	0	5
Quality of Work Life	2	0	1	0	0	0	0	0	0	0	3
Maintenance	2	0	0	0	0	0	0	0	0	0	2
Counts Total	193	122	58	25	20	16	16	13	4	5	472
Articles Total	180	108	52	23	20	15	15	11	4	ŝ	431
Double Count Number	13	14	9	2	0	1	1	2	0	2	41

Table 4 Matrix of topic areas vs. methodologies

Table 5Classification of articles by number of authors

Journal	Years	Single		Multiple	
		Author	Articles	Author	Articles
		Total	%	Total	%
DS	1995-1999	7	20.00	28	80.00
	2000-2004	6	28.57	15	71.43
IJOPM	1995-1999	0	0.00	0	0.00
	2000-2004	7	21.88	25	78.13
IJPR	1995-1999	37	66.07	19	33.93
	2000-2004	27	30.00	63	70.00
JOM	1995-1999	9	20.45	35	79.55
	2000-2004	7	13.21	46	86.79
MS	1995-1999	1	7.14	13	92.86
	2000-2004	3	23.08	10	76.92
POM	1995-1999	1	14.29	6	85.71
	2000-2004	15	22.73	51	77.27
Totals	1995-1999	55	35.26	101	64.74
	2000-2004	65	23.64	210	76.36