

RECENT TRENDS IN OPERATIONS MANAGEMENT: A META-ANALYTIC STUDY

Milind Padalkar, Gopalakrishnan Narayanamurthy, and Saji Gopinath*

Quantitative Methods & Operations Management

Indian Institute of Management Kozhikode (IIMK), Kozhikode, Kerala – 673570, India.

* E-mail: saji@iimk.ac.in Phone: +91 - 495 - 2809421

Extended Abstract

Purpose

Research in Operations Management (OM) continues to evolve in terms of topics, themes, motivations, paradigms, and methodologies. Several studies note the shifting nature of OM research across diverse topics; however they generally draw their sources from a single or a few peer-reviewed journals, and do not include a detailed analysis of the research motivations. The dynamism of OM research has led to emergence of new topics in the past two decades. Given that OM literature lacks recent meta-analytic studies, we believe an update on the emergent OM topics would help OM researchers in developing proper understanding of the emerging research areas. We also believe that analysis of research trends for emergent OM topics, supplemented by research paradigms, perspectives, methodologies and motivations/directions will be particularly useful for researchers. Our contribution to literature consists of offering an integrated view of paradigmatic and methodological moorings of research and its motivations for the emergent OM topics.

Design/methodology/approach

We broadly anchor our study to Pannirselvam et al (1999) which discussed the evolution and research trends in OM in terms of 17 topics. We accept their topic definitions, and limit our analysis to six selected research topics that have shown evolutionary trends, namely Agility, Operations Strategy, Project Management, Quality Management, Process Design, and Sustainability (Heineke and Davis 2007; Schroeder et al. 2005; Craighead and Meredith 2008; Bayraktar et al. 2007; Sprague 2007). We draw on Filippini (1997) and Pannirselvam et al (1999), to pick three traditional OM topics: Operations strategy, Quality management, and Process design; and note that later studies confirm continued growth in these topics (Gupta et al, 2006; Taylor & Taylor, 2009). We add three topics Project management, Sustainability, and Agility to our study for the following reasons:

Project management has been long considered as an OM topic, however successive meta-studies have noted little or no growth in Project management research (Filippini, 1997; Pannirselvam et al, 1999; Gupta et al, 2006; Taylor & Taylor, 2009), and stressing the importance of this topic within OM, and offering a conjecture that the project management research may be targeted at specialist journals rather than mainstream OM journals due to the eclectic nature of the field (Taylor & Taylor 2009; Gunasekaran & Ngai, 2012). We accept this conjecture by Taylor & Taylor (2009), and include Project management in our study. We observe that environmental issues and sustainability has emerged as an important topic within OM (Gupta et al, 2006; Taylor & Taylor, 2009; Gunasekaran & Ngai, 2012). Agile manufacturing was originally popularized in 1991 by a group of scholars at Iacocca Institute of Lehigh University in USA and was advocated as the 21st century manufacturing paradigm in the field of operations management. Within eight years of publication of Iacocca report, many publications on agility appeared in books, trade magazines, and academic journals (Yusuf et al., 1999). Thus, agile manufacturing can evidently be seen as a significant and maturing research trend in the field of OM post 1991. Service operations management and Supply chain management are two other topics that have emerged after 1990's and have attracted considerable and productive research interest. We believe that literature on both these topics is sufficiently rich to warrant separate studies. Therefore, we exclude these topics from our study.

Pannirselvam et al (1999), focused on seven mainstream OM journals. However, consistent with our conjecture that later research may have targeted a different selection of journals, we begin with keyword searches based on topic names on EBSCOhost, Emerald, ProQuest, Sage, and Google Scholar, and expand the period of enquiry to 1991-2014. Based on the keyword search results, we verify that the journals selected by Pannirselvam et al (1999) have continued to be major outlets for all selected topics except project management. Papers are excluded from our dataset if they focus on narrow problem contexts, handle research questions having limited applicability, or have marginal outcomes that do not advance the research agenda for the given topic. A total of 458 papers are selected in the dataset for our study (Table 1). We find

that the journal mix for each topic is different. For each selected paper, we codify structural attributes related to research themes, motivations, methodologies employed, and temporal shifts in the selected topics.

Table 1: Distribution of journal papers for six research topics for 1991-2014¹

Journal name	Agility	Operations strategy	Process design	Project Management	Quality Management	Sustainability	Total
DS		6	1	3			10
IJOPM	68	21	9	9	49	35	191
IJPE		6	9	2			17
IJPR		4	27	11			42
IJPM				32			32
JOM	5	13	20	11	26	11	86
Omega		2	1	1			4
POM		15	8	2	13	21	59
PMJ				17			17
Total	73	67	75	88	88	67	458

Findings

Reviewing the dataset for research paradigms² over two sub-periods: 1991-2004 and 2005-2014, we find that operations strategy, process design and project management show increasing share of interpretive research (Table 2). This supports the emergent nature of these topics and indicates that the research attention in these topics is on theory-building and on complex aspects of phenomena where variables and relationships are yet to be extracted. A reverse trend is seen in agility, quality management, and sustainability. Agility and sustainability are seen to show descending trend in interpretive paradigm and ascending trend in positivistic paradigm. The decline can be explained by the growing maturity of both these fields in past two decades; with most of the recent studies attempting to test and generalize theories to enhance transfer of best practices across organizations and geographies. We find an overall decline in quality management papers, supporting the inference by Sousa and Voss (2002) about maturation of research; and offering a contra-perspective to Gupta et al's (2006) study which shows growth in this field. We offer an explanation that the latter study was based on papers from a single journal, and hence its findings are specific to the journal rather than the state of the field.

Table 2: Research paradigms over time

Research paradigm	Interpretive		Positivistic		Both	
	1990-04	2005-14	1990-04	2005-14	1990-04	2005-14
Agility	30	16	9	13	4	1
Operations strategy	1	2	23	41		
Process design		6	15	52		2
Project Management	1	6	33	48		
Quality Management	30	6	30	20		2
Sustainability	16	9	15	23	3	1
Grand Total	78	45	125	197	7	6

Conceptual and empirical are two main research perspectives. The former views the phenomena through theoretic frameworks abstracted from the reality whereas the latter is grounded in data. Optimization, computation and simulation types are also identified and the perspective trends are inferred over the two time periods 1991-2004 and 2005-2014

¹ Acronyms used: Decision Sciences (DS), International Journal of Operations and Production Management (IJOPM), International Journal of Production Economics (IJPE), International Journal of Project Management (IJPM), International Journal of Production Research (IJPR), Journal of Operations Management (JOM), Production and Operations Management (POM), and Project Management Journal (PMJ).

² See Morgan (1980)

(Table 3). We find that except quality management, all topics have grown over the 2005-2014. Abstract conceptual methods show growth in operations strategy, process design and project management, whereas there is a decline in agility, quality management and sustainability. This suggests that the latter three areas are possibly at a lower level of research maturity, and offer further scope for theory-building and elicitation of new variables and relationships. Further, the growth of empirical research methods in all topics except quality management suggests continuing research enquiry into possibly divergent streams. Growth in synthetic perspective for operations strategy, process design, and project management suggests a rising trend for building models or frameworks.

Table 3: Topic-wise research perspectives over time³

Research perspective	Abstract conceptual		Empirical		Synthetic	
	1990-2004	2005- 2014	1990-2004	2005-2014	1990-2004	2005-2014
Agility	17	4	25	26	1	
Operations strategy	7	11	16	22	1	10
Process design	11	39	4	15		6
Project Management	15	21	15	24	4	9
Quality Management	18	2	42	26		
Sustainability	10	3	24	30		
Grand Total	78	80	126	143	6	25

Research outcomes are classified into 9 categories: discussion paper, literature review, method, model/framework, practice review, strategy, theory-building, theory-testing, and variables or factors. Methods and models/frameworks are the leading research motivations for process design and project management. This suggests that the research seeks to unravel interaction effects of the associated variables and factors. Models/frameworks followed by variables/factors are the leading research motivations for operations strategy. A review of these papers indicates emergence of a new stream of research as operations strategy addresses the issues of globalization, outsourcing, sustainability, etc. ‘Model/framework’ category dominates the research outcomes in the domain of agility, quality management, and sustainability followed by the ‘variables and factors’ category. In these three research topics, the results obtained can be attributed to the implementation nature of the domain where researchers are attempting to develop implementation models and frameworks and identify explanatory factors and variables that are associated with the frameworks.

For the purpose of our analysis, we classify the methodologies into quantitative, qualitative and survey methods. Quantitative methods include decision theoretic and/or analytical approaches, heuristic methods, mathematical methods, mathematical programming, simulation, and probabilistic or statistical methods. Qualitative methods include case study (single or multiple), field or interview-based research, archival analysis, discussion or expert opinion, and grounded theory. Survey methods include exploratory or confirmatory surveys, literature reviews, practice reviews etc. We find all-round growth in the three methodological classifications in Operation strategy, Process design, and Project management, suggesting that these topics offer a broad scope of research problems amenable for a variety of research methods, and confirming the prior studies about continuing growth in these topics. Agility and Sustainability see sharp growth in survey methods and a strong disinclination for quantitative methods. This suggests that research in these topics seeks to obtain correlations and generalizations based on empirical data, and is tending towards building of models and frameworks. As observed by Gunasekaran and Ngai (2012), research in quality has matured and researchers’ view towards quality has remained limited to an attribute of competitive priorities.

Research motivations at any given time inform on the state of the field. Along with the researchers’ paradigms and perspectival preferences, they drive the methodological choices. A typology of research motivations therefore can reveal the questions being investigated as well as the probable future direction for the field; and can be a useful supplementary to the literature reviews and scholar’s opinions about the future directions. We continue with the two time periods of 1991-2004 and 2005-2014 to assess the trends in research motivations. Articles addressing agility implementation increased in number in past decade. Articles assessing the impact of agility were equally distributed in the both the decades but were minimal in number. Impact of agility and uncertainty linkage studies started appearing in the past decade. Flexibility manufacturing understanding, implementation, and impact articles have appeared in significant number in both the

³ Abstract conceptual category includes conceptual, heuristic, optimization, and simulation.

decades. Interest in sustainable supply chain management (SSCM) has increased in the past decade with inclination towards social sustainability, environmental green SCM and SSCM impact on shareholder wealth. Sustainability implementation shows a shift from its standalone achievement to cross-functional questions such as Sustainability in New product development. Environmental management (EM) at firm level shows almost equal number of papers in both periods. EM impact on other departments in the organization has also been studied in both periods. Manufacturing strategy, new product development, and performance management continued to be the major research questions under operations strategy for both time periods. We could discern no shift in the research agenda over the two periods for manufacturing strategy and performance management. For new product development, the research focus was on inter-unit interfaces during 1991-2004, shifting to antecedents, models, and frameworks during 2005-2014. Mass customization and supply chain questions appear on the research agenda during 2005-2014. Most of the papers on process design related to process design variables and methods; and supply chain design and delivery methods. Both areas accelerated considerably during 2005-2014. Sustainability issues around closed loop supply chain also appeared on the research agenda during 2005-2014. Papers in quality management dealing with implementation, assessment, and cross-functional declined considerably in the last decade. Studies were more focused towards quality management implementation and assessment in a firm in the initial decade but later moved to study also the impact of organization culture, country context, leadership, innovation etc. on quality management. Last decade had more articles addressing research in supply chain quality management. Articles addressing general service quality and E-quality have also appeared in the past literature but are very minimal in number. As conjectured, research on project management is featured in a broad range of journal outlets. We note that several research motivations are well subscribed over the two periods; with growing trends in Success or failure factors, Project complexity, Project uncertainty and risk, Human behavioral and organizational issues, and Intervention methods. We find a sharp increase in research on behavioral issues and on uncertainty and risk, suggesting continued search for explanation of project phenomena – especially success, risk management and execution control.

Originality/value

This study updates the pre-2000 meta-analytic studies for the selected OM topics. Of the three topics that showed growing trend in the earlier studies, we find that operations strategy and process design have continued to grow, whereas quality management has matured and shows declining research interest. We report on research trends on two new topics of agility and sustainability which have emerged post 2000. We show that research in project management has been growing and finds specialist journal outlets. Therefore the early meta-studies which are based on mainstream OM journals have not captured this growth. Our study expands on the earlier meta-studies by offering an analysis of research motivations and research questions. We believe this will aid future researchers in shaping their research agenda.

Research limitations/implications

Present study is limited by the number of journals reviewed. While we have taken due care in selecting papers for the review, some sampling errors are possible. Future study would attempt to review larger number of OM journals for six topic areas chosen.

Keywords: Operations Management, Literature Review, Emergent topics, Research trends

References

(References for the complete dataset are available with the corresponding author and will be provided on request)

- Bayraktar, E., Jothishankar, M. C., Tatoglu, E., & Wu, T. (2007). Evolution of operations management: past, present and future. *Management Research News*, 30(11), 843-871.
- Craighead, C. W., & Meredith, J. (2008). Operations management research: evolution and alternative future paths. *International Journal of Operations & Production Management*, 28(8), 710-726.
- Filippini, R. (1997). Operations management research: some reflections on evolution, models and empirical studies in OM. *International Journal of Operations & Production Management*, 17(7), 655-670.
- Gunasekaran, A., & Ngai, E. W. (2012). The future of operations management: an outlook and analysis. *International Journal of Production Economics*, 135(2), 687-701.
- Gupta, S., Verma, R., & Victorino, L. (2006). Empirical research published in production and operations management (1992–2005): trends and future research directions. *Production and Operations Management*, 15(3), 432-448.

- Heineke, J., & Davis, M. M. (2007). The emergence of service operations management as an academic discipline. *Journal of Operations Management*, 25(2), 364-374.
- Pannirselvam, G. P., Ferguson, L. A., Ash, R. C., & Siferd, S. P. (1999). Operations management research: an update for the 1990s. *Journal of Operations Management*, 18(1), 95-112.
- Schroeder, R. G., Linderman, K., & Zhang, D. (2005). Evolution of quality: first fifty issues of production and operations management. *Production and Operations Management*, 14(4), 468-481.
- Sousa, R., & Voss, C. A. (2002). Quality management re-visited: a reflective review and agenda for future research. *Journal of Operations Management*, 20(1), 91-109.
- Sprague, L. G. (2007). Evolution of the field of operations management. *Journal of Operations Management*, 25(2), 219-238.
- Taylor, A., & Taylor, M. (2009). Operations management research: contemporary themes, trends and potential future directions. *International Journal of Operations & Production Management*, 29(12), 1316-1340.
- Yusuf, Y. Y., Sarhadi, M., & Gunasekaran, A. (1999). Agile manufacturing: The drivers, concepts and attributes. *International Journal of production economics*, 62(1), 33-43.