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Invited Contribution

Guiding the next generation of doctoral students in operations management

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ABSTRACT

This paper presents ways for senior researchers to help future doctoral students in Operations Management (OM) to overcome multiple challenges in the following: (a) conducting relevant research while demonstrating greater rigor, and (b) exploring multi-disciplinary research projects while mastering a single research method. Recognizing that knowledge is generally created in four broad stages ((I) awareness, (II) framing, (III) modeling and (IV) validation), we first argue that different research approaches (analytical, behavioral, case study, or empirical) serve different roles in each of these stages: (1) case study approach for awareness, (2) empirical methods for framing, (3) analytical modeling for modeling and analysis, and (4) behavioral for validation in the real world. Then we discuss ways to enable doctoral students to overcome the aforementioned challenges.

Contents

1. Introduction

This article seeks to catalyze discussion on how to guide PhD students and other junior researchers in business schools. Our motivation is that today's operations management (OM) doctoral students face big challenges as they are required to conduct research that is more rigorous and relevant for publications in journals that 'matter' for academic employment and promotion in business schools. Moreover, many junior researchers in Asia and

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Europe are being asked to raise funds or apply for research grants through collaborative multi-disciplinary projects in areas of national importance such as environmental sustainability, healthcare management, and maritime studies, while being expected to develop mastery of a single methodological approach. We seek to provide a framework for thinking about OM research that could help to resolve these apparently conflicting demands on doctoral students and other junior researchers.

Our approach to catalyze discussion is as follows: we take the purpose of OM research to be refining knowledge in four broad stages – (I) awareness, (II) framing, (III) modeling and (IV) validation. Researchers including doctoral students, usually rely on a particular research method – analytical, behavioral, case study (and related), or empirical. However, we argue that each research method is strong in only one particular stage of research: (1) case study approach for awareness, (2) empirical methods for framing, (3) analytical modeling for modeling and analysis, and (4) behavioral for validation in the real world. Hence, when researchers focus only on a single research method, it can create two problems for the OM community: (a) 'islands of methodology' and (b) disconnect from practice. These two problems may help explaining why there is growing pressure for conducting collaborative research that is relevant to practice. Therefore, a 'solution' to problems (a) and (b) is to recognize that different research methods and research outcomes should align and feed into each other to form coherent research streams. Such braided research streams will be far more potent for refining knowledge than islands of methodology.

Implications for such a viewpoint require broadening, not contradicting, the traditional understanding of 'rigor'. Traditionally, rigor for a particular piece of research, say a doctoral dissertation, is viewed primarily from a technical perspective that depends on the research method within a particular stage. However, we believe that the chosen research method should suit the stage at which the particular research is situated within this stream. Also, each piece of research work should build on the research stream that uses different research methods at different stages for internal consistency. Moreover, there should be a real world situation that motivates the research stream and a potential (or actual) application for external consistency.

Actionable implications of this view are that supervisors should help doctoral students: (1) to select an appropriate research method especially when these students are learning certain research results that are based on different research methods, (2) to "triangulate" results within the same research stage by comparing results with other research that used a different research method but used the same inputs, and (3) to engage practitioners in the research process in order to motivate research at one end (e.g., Stanford Global Supply Chain Forum) and to validate research at the other end (e.g., POMS Applied Research Challenge).

The rest of the article is structured as follows: Section 2 summarizes different OM research methods. Section 3 views the use of these methods for any OM area as part of a four-stage research pipeline and sets up the 'problem', i.e., requiring the understanding of 'rigor' as research stream integrity and coupling with practice at either end. Section 4 proposes the basis for a solution before the conclusion in Section 5.

2. Background: different OM research methods

There are different research methods for conducting OM research (Karlsson, 2009) and 'rigor' has different implications in different methods. Below we list four broad categories of research methods (in alphabetical order) with some references as examples:

2.1. Analytical modeling

This approach originated from operations research and management science whereby results are deduced from principles originated from computer science, economics, engineering, mathematics or physics. Mathematical optimization methods (e.g., Large-scale linear programming, stochastic programming, and dynamic programming) are also analytical models for solving real and complex operations problems. OM researchers also bring in concepts and theories from microeconomics to challenge traditional OM models. For example, Netessine and Tang (2009) present a compilation of recent OM research articles that do away with traditional assumptions of exogenous demand and fully observable information and actions, and instead use economic analytical models (game theory, contract theory, mechanism design, etc.) to capture endogeneity and hidden information and actions. Such research can lead to counter-intuitive results involving the interactions of multiple parties and can therefore be more impactful than traditional models (Cachon, 2012). Different types of simulation methods, including cellular automata or multi-agent modeling, also fit here although simulation results are inferred from simulation runs rather than deduced from analytical assumptions.

2.2. Behavioral

By conducting experiments originated from psychology to infer actual decision-making, researchers can either validate or challenge the implications of certain analytical models. Croson and Donohue (2006), Croson et al. (2007), and Katok and Wu (2006) conduct different behavioral experiments to explore different OM issues ranging from information sharing, channel coordination, and supply contracts in the context of supply chain management. Loch and Wu (2007) present a set of methods and a structured area of study to analyze behavioral issues within the OM paradigm to guide OM researchers who wish to conduct behavioral experiments pertaining to OM issues.

2.3. Case study/grounded theory/action research

These approaches are broadly based in the social sciences where 'results' are generalized from detailed observations of practice. Voss et al. (2002) argue that case study and other field-based research are appropriate research methods for OM research because OM deals with complex management issues.[2] In the business-school setting, there are two main types of case studies: those for pedagogy to introduce students to managerial decision-making in challenging business situation and those for exploratory research to set the stage for theory building by identifying key concepts and their relationships (Eisenhardt, 1989); however, the term 'case study' is also loosely used by practitioners and researchers as an example from an actual business setting – in this paper, we mainly refer to case studies for research. However, Barratt et al. (2011) note that the success rate for publishing case study OM research in top-tier academic journals is relatively low partly because case-based methods are perceived as being less structured than analytical modeling or empirical research and possibly only descriptive research (i.e., not leading to theory building). Meredith (1998), Barnes (2001), Stuart et al. (2002) and Seuring (2008) discuss ways to improve 'rigor' in case studies. Glaser and Strauss (1967) and Strauss and Corbin (1997) explain grounded theory as a way to carry out, document and present qualitative research rigorously. Action research seeks to bring

[2] In the same vein, Yip (2011) argues that practitioners "prefer to read articles in management journals that are based on in-depth case studies where there are more variables than observations, rather than large sample statistical studies with many more observations than variables."