

Theorizing in Sales and Operations Planning

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Abstract

Although there is a significant increase in the number of empirical studies in Sales and Operations Planning (S&OP), there is a need to understand how these studies can contribute to theorising in S&OP. Therefore, this paper's main goal is to offer a conceptual synthesis framework to review empirical research on S&OP from a theoretical perspective, aiming to offer a novel approach towards contributing to theorising in S&OP. The paper builds on the systematic literature review approach and guides its findings on the analytical steps of realist synthesis. The paper offers a first attempt to provide preliminary S&OP context-mechanisms-outcome configurations.

Keywords: Realist synthesis, Middle-range theory, Cross-functional integration

Introduction

There has been a significant growth of interest in Sales and Operations Planning (S&OP) by both academics and practitioners. The increase in the number of publications in the academic literature, as well as in the grey literature corroborates this interest (Thomé et al., 2012; Tuomikangas and Kaipa, 2014; Kristensen and Jonsson, 2018). The number of empirical studies among the overall publications has grown as well, especially in the recent years. Despite the growing empirical evidence on S&OP, addressing the gap between research and practice, there is a lack of research regarding the contributions of these empirical studies towards theorising in S&OP. The need to address this literature gap is reinforced when one considers the call for theorising in Operations Management (OM). The discipline of OM counts with a wide number of theories based on real-life events and empirical evidence (Handfield and Melnyk, 1998; Boer et al., 2015). However,

the literature in OM is largely a-theoretical or based on theories emanating from other disciplines (e.g., Defee et al., 2010).

The integrated view of theory and empirical research is consistent with the strategy of theory-building using middle-range theory (MRT), which is a concept developed by Merton (1968). Originating from the field of sociology, it has since been applied in a number of disciplines, such as medicine, organizational research, strategy, marketing, or OM (Soltani et al., 2014; Ivert et al., 2015a, Jonsson and Holmström, 2016).

Building upon the need for theory-informed research in OM (Handfield and Melnyk, 1998) and applying the strategy of MRT, this study focuses on Sales and Operations Planning (S&OP), an emerging OM topic. Therefore, the goal of this paper is to offer a conceptual synthesis framework to review the empirical research on S&OP from a theoretical perspective, and thus aiming to provide a novel approach towards contributing to theorising in S&OP.

This paper is organised into five sections, with this one being the introduction. The second section provides the literature background followed by the section about the research approach and methodology adopted. Then the paper describes the preliminary findings in section four. The final section offers the closing considerations, emphasising a synthesis of the results achieved so far and an outlook for future research.

Literature Background

This section provides a brief background on MRT in OM, the main steps for empirical research, and offers an overview of the conceptual building blocks for S&OP.

Middle-Range Theorizing in OM

The literature offers different definitions and perspectives for theory. This paper follows Campbell's (1990) definition ascertaining that a theory can be assessed by its capacity to elucidate variance in the criterion of interest (Colquit and Zapata-Phelan, 2007). Therefore, theory can be defined as "a collection of assertions, both verbal and symbolic, that identifies what variables are important and for what reasons, specifies how they are interrelated and why, and identifies the conditions under which they should be related or not related" (Campbell, 1990, p. 65; Colquit and Zapata-Phelan, 2007). According to Wacker (1998, p. 363), theories should consist of "four components, (1) definitions of terms or variables, (2) a domain where the theory applies, (3) a set of relationships of variables, and (4) specific predictions (factual claims)".

As stated by Handfield and Melnyk (1988, p.321), empirical studies are "the most severe test of all theory and research." Empirical investigations provide the basis for the ability to build valid theories in OM (Meredith, 1993; Handfield and Melnyk, 1998). In empirical research, theory building and theory validation could combine different theories into a meta-theory (Torraco, 2005), refute existing theories, amend, expand, and confirm, or develop new ones, defining their field of application and boundaries (Boer et al., 2015). This intertwined view of theory and empirical research is consistent with the concept of MRT.

MRTs can be defined as "theories that lie between the minor but necessary working hypotheses that evolve in abundance during day-to-day research and the all-inclusive systematic efforts to develop a unified theory that will explain all" (Merton 1968, p. 39). Thus, MRT is situated between the so-called "piecemeal empiricism" and the other extreme called "grand theories" and attends to three basic rules: sufficient abstraction; logical derivation; and adaptive, cumulative explanations (Pawson, 2010). This middle-range approach is important to research in OM to "further create a higher abstract level of theoretical knowledge" (Soltani et al., 2014, p. 1012). According to Stank et al. (2017),

MRT addresses questions as “what works for whom?”, “How?”, “Under what circumstances?” MRT theorising has the following distinctive features, according to Stank et al. (2017). It is a synthesis of empirical findings, relying on a limited set of realistic assumptions. It defines concepts, restricts theoretical propositions, and makes predictions bound to the focal domain of interest. It provides the basis for linkages to more general theories.

Systematic Literature Review (SLR) is a method of choice to synthesise empirical findings, evidencing the regularities of recurrent events (Pawson and Tilley, 1997). Realist review (Pawson et al., 2005) is a research synthesis particularly prone to MRT research (Denyer et al., 2008), and to unveil context-mechanism-outcome configurations (CMOC). The concept of CMOC is rooted in Pawson and Tilley’s (1967) axiomatic epistemological premise that context + mechanisms = outcomes. Context is the internal and external environment of an operation, such as a specific industry or market complexity. Mechanisms are management interventions, such as planning or training, and behavioural changes resulting from these interventions, as truth or cross-functional integration. Outcomes are the intermediate or end results of operations. In this perspective, MRT is a research strategy aiming to unveil CMOCs through the observation of regularities, rates, and repetitions of specific mechanisms, producing outcomes in a given context.

Steps for empirical research in Operations Management

MRT is subject to the rules and procedures governing empirical research. According to Flynn et al. (1990), the term “empirical” refers to observations from the real world and is used “to describe field-based research which uses data gathered from naturally occurring situations or experiments”. The main steps for empirical research in OM, as proposed by Flynn et al. (1990), consist of establishing the theoretical foundation, selecting a research design and data collection method, study implementation, data analysis, and reporting of results. This subsection follows this systematic approach, complementing it with current research streams of practice or field-based research (De Horatius and Rabinovich, 2011) and quality appraisal of primary research (Valentine, 2009). It provides a brief description of the main steps.

The initial step to conduct empirical research is to establish the theoretical foundation (Flynn et al., 1990). By clearly expressing the theory (or theories) applied, misinterpretation can be avoided, and the standard of acceptable research is reinforced (Defee et al., 2010). This clear statement allows an understanding of the researcher’s assumptions and premises, aides the clarity and parsimony in the analysis and interpretation of results, drives the selection of research design, data collection methods, and can assist in gauging primary research quality.

The selection of research design should be in line with the theoretical foundation and be adequate to either build or validate theories. Research designs can be quantitative, qualitative, or combining these two. The mixed-methods research design approach can provide a better understanding of the phenomenon, although their use in OM is more seldom (Golicic and Davis, 2012). Historically, surveys were the most common research design in OM (Flynn et al., 1990). Single and multiple case studies are equally a prominent research design in OM (Voss et al., 2002), along with field experiment, panel study, focus group discussions and action research.

Data analysis methods may be quantitative, qualitative, or mixed-method. Quantitative methods may include descriptive statistics, regression or correlation, cluster analysis, path analysis, data reduction (e.g., factor, correspondence, principal components), means testing, chi-Square Test, and F-test, among others (Flynn et al., 1990). Qualitative

methods may include field notes summarisation in the form of a detailed case study, process mapping, and coding structure, content analysis and categorisation schemes to reveal key constructs (Krippendorff, 2008).

Quality appraisal of primary research is a debatable but necessary issue. Appraisals usually consider construct, internal, external, and statistical validity (Valentine, 2009), based on research design and data collection. Quality is “the fit between a study’s goals and the study’s design and implementation characteristics” (Valentine, 2009, p.130), which relates to the validity of the findings. External and construct validity are directly related to the ability of a research design to produce generalizable results for evidence-based management (Rousseau, 2012), which is paramount for theory building using the strategy of MRT. External validity relates to the strength of evidence or the potential to replicate results in different settings (Valentine, 2009). While external and construct validities may apply to studies that adopt either qualitative or quantitative approaches, internal and statistical validities may apply to studies that adopt quantitative approaches examining causal relationships (Thomé et al., 2016a). For different and divergent perspectives in quality appraisal in primary research, the reader is referred to Popay et al. (1998), Pawson (2002), and Reay et al. (2009).

Sales and Operations Planning

The literature offers different definitions for S&OP, which is considered both a process and as a management practice. This paper follows the definition of the APICS dictionary, which embraces the essential characteristics of S&OP and defines S&OP as follows: “A process to develop tactical plans that provide management the ability to strategically direct its businesses to achieve competitive advantage on a continuous basis by integrating customer-focused marketing plans for new and existing products with the management of the supply chain. The process brings together all the plans for the business (sales, marketing, development, manufacturing, sourcing, and financial) into one integrated set of plans. It is performed at least once a month and is reviewed by management at an aggregate (product family) level. The process must reconcile all supply, demand, and new product plans at both the detail and aggregate levels and tie to the business plan. It is the definitive statement of the company’s plans for the near to intermediate term, covering a horizon sufficient to plan for resources and to support the annual business planning process. Executed properly, the sales and operation planning process links the strategic plans for the business with its execution and reviews performance measurements for continuous improvement.” (Blackstone, 2013, p. 154).

To capture the building blocks of the S&OP concept, Thomé et al. (2012) established a generic S&OP framework, which provides a detailed overview, embraces the relevant elements and decision variables of the process, and displays the dimensions of vertical and horizontal alignment in a systematic and holistic manner (Ivert et al., 2015a, 2015b). It served as the basis for developing more specific frameworks focussing on different S&OP aspects (Tuomikangas and Kaipia, 2014; Hulthén et al., 2016; Noroozi and Wikner, 2017) and was used to guide case study research (Ivert et al., 2015a, 2015b). Besides that, it was adapted to other supply chain integration practices (Hollmann et al., 2015) and used for teaching S&OP in university settings (Scavarda et al., 2017). Therefore, Thomé et al.’s (2012) framework will also be adopted in this paper. Its dimensions are business and strategic plans, operations, context, inputs, structure and processes, outcomes, and results. Figure 1 depicts the framework’s main building blocks.

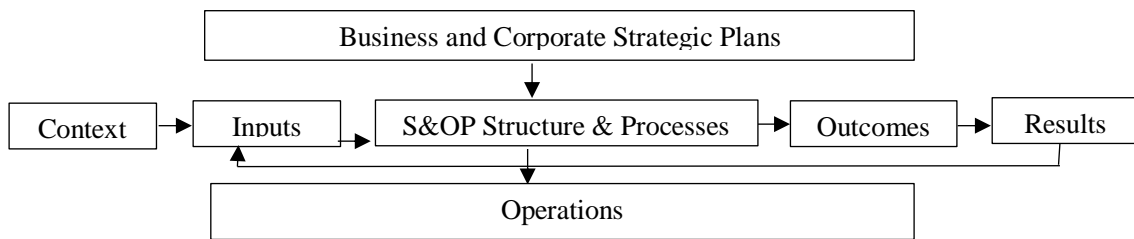


Figure 1 – Generic S&OP framework, adapted from Thomé et al. (2012)

Business and the corporate strategic plans directly influence the S&OP and shape its motivations as well as the expected results for the organisation. Context embraces aspects as the manufacturing strategy, the hierarchical planning level, the planning horizon adopted, and product characteristics, which influence the S&OP. Its inputs, the structure and processes, and the outcomes and results depict the S&OP process itself. Inputs are data, plans, and constraints from different functional areas. Structure and Processes include meetings and collaboration, organisation, information technology and S&OP metrics. Plan integration and profit optimisation are the outcomes and results of the S&OP (Grimson and Pyke, 2007).

Research approach and methodology

This section presents the conceptual synthesis framework used to assist in reviewing the empirical contributions regarding theorizing in S&OP on the middle range. Afterwards, the approach of SLR and the method of realist synthesis are introduced.

The conceptual research synthesis framework is based on the Literature Background section and consists of three dimensions with corresponding categories. The first dimension contemplates the questions addressed by MRT as “what works for whom?”, “How?”, “Under what circumstances?” (e.g., Stank et al., 2017) and leads to the identification of CMOCs. The second one addresses the studies' methodological approach and contemplates the main steps for empirical research in OM (e.g., Flynn et al., 1990; Valentine, 2009; De Horatius and Rabinovich, 2011). It aids in the analysis of the theoretical foundation, research design, implementation, quality appraisal and strength of evidence of selected studies. The third dimension focusses on main elements that build the S&OP concept: business & corporate strategic plans, context, inputs, structure and processes, outcomes and results (Thomé et al., 2012). The framework is presented in figure 2.

The conceptual synthesis framework is ingrained in conceptual deduction based on logical reasoning to assist theory building to "identify relevant variables, classify them, describe their interactions, and allow a mapping of items (such as the existing literature or research studies) on to the framework" (Meredith, 1993, p.8). The conceptual framework is consistent with a formal MRT focus, being conducive to comparative analysis of substantive models, frameworks, and theories (Bourgeois III, 1979). This framework is rooted on previous research and is an attempt to contribute towards theorising in S&OP on the middle range, abiding by Merton's (1968) three rules of sufficient abstraction, logical derivation and adaptive, cumulative explanations (Pawson, 2010).

To apply this conceptual research synthesis framework, conducting a systematic literature review (SLR) appears the suitable method. SLR is a research design approach going beyond a simple review of previous studies (Tranfield et al., 2003; Thomé et al., 2016b), constituting a research undertaking by itself. SLRs are conceptual research methods leading to "synthesising previous research, thus building on earlier studies, and

depend heavily on real-world description, thereby serving as a check on the external validity of [...] research findings" (Meredith, 1993, p.11).

Middle-range Theorizing	What works for whom?
	How?
	Under what circumstances?
	Why?
Steps for empirical research in OM	Theoretical Foundation
	Research Design
	Collection Method, Implementation, and Data Analysis
	Quality Appraisal of Primary Research
S&OP conceptual building blocks	Business and Corporate Strategic Plans
	Context, Input, Structure & Processes
	Outcomes and Results

Figure 2 – Conceptual research synthesis framework

In addition, the application of the conceptual synthesis framework to review the literature in S&OP corresponds to Torraco’s (2005) call for the use of SLRs to build meta-theories. Besides the importance of conducting an SLR guided by the conceptual research synthesis framework, this paper reviews the literature without covering completely all the activities of the step-by-step approach proposed by Thomé et al. (2016b). The complete systematic review is recommended for future research. The current literature review did count with coding schemes for the S&OP building blocks, applying the CMOC logic. It applied the keywords “Sales and Operations Planning” to titles, abstract and keywords of papers in EBSCO, Scopus and Web of Sciences databases, and the criteria for exclusion of papers consistent with Thomé et al. (2012) and Tuomikangas and Kaipia (2014). Subsequently, backward and forward searches were used. The analysis was guided by the analytical steps of realist synthesis proposed by Pawson et al. (2005), aiming to offer a first attempt to provide preliminary S&OP CMOCs, as presented next within this paper.

Preliminary findings

The SLR returned 45 empirical studies in S&OP, depicting a significant growth in the recent years, with around half of the identified studies published in the last four years. The research findings point to the fact that most of the empirical studies in S&OP are a-theoretical and that the few ones that adopt theories, borrowed those from disciplines outside of OM. Among the research designs adopted in these studies, case studies are the most prevalent, followed by surveys and mathematical models. The sample size and the number of cases investigated differ among the empirical studies. Accordingly, the validity of the research findings varies significantly.

Many of the conceptual S&OP building blocks are covered by the empirical literature, although the number of studies covering the different elements differ. The context of the S&OP implementation varies significantly among the empirical studies. Different geographic regions are considered, counting with countries from Scandinavia, North Europe, Western Europe, North America, South America, Asia Pacific, Middle East, and Australia. An S&OP implementation in Africa could not be identified. Companies with a different number of employees and revenues are also considered. Different studies are dealing with various elements of the S&OP process in discrete and continuous industries, as well as in public and private service sectors. However, it is often stated that a complete

characterisation and common understanding of the S&OP process is missing (e.g. Pedroso et al., 2016; Noroozi and Wikner, 2017; Qi and Ellinger, 2017). When specified, S&OP is mostly situated at the tactical level with a planning horizon around one year.

The CMOC most frequently found in the literature reports S&OP's intervention to the operational performance of the firm, in contexts and through mechanisms summarised in Figure 3, which follows a template inspired by Stank et al. (2017). It is offered as a first proof of concept of the application of the conceptual research synthesis framework of Figure 2. The first layer depicts the X (intervention) -> Y (outcome) relationship, stating that S&OP improves operational performance dimensions of quality, flexibility, and delivery. The second layer specifies how S&OP affects operational performance, through the specific mechanisms of S&OP measurement, meeting and organisation, technological integration, and integration of plans. The third layer states for whom (under what circumstances) and describes the specific context of intervention. The fourth layer introduces formal MRT (Bourgeois III, 1979), aiming at a higher level of abstraction, and proposes to investigate why this S&OP CMOC is effective. It adds the Qi and Ellinger's (2017) research proposition linking S&OP to the antecedents of the firm's orientation towards services, market, finance, and supply chain. The introduction of Qi and Ellinger's (2017) research proposition also corresponds to Stank et al.'s (2017) description of MRT role of providing linkage with more general theories.

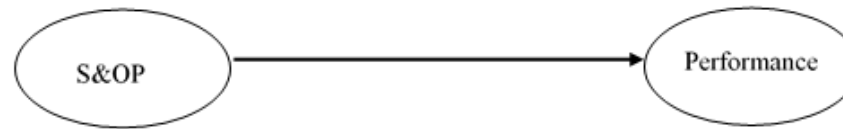
Final Considerations

This paper presents a conceptual framework to review the empirical studies on S&OP from a theoretical perspective to develop a deeper understanding of S&OP in research and practice. The conceptual synthesis framework consists of the three dimensions: middle-range theorising, steps for empirical research in OM, and S&OP conceptual building blocks. Accounting for sufficient abstraction, logical derivation, and cumulative knowledge, the three basic rules of MRT, the framework appears suitable for guiding MRT research.

The application of the framework for investigating the empirical studies' contributions towards theorising in S&OP confirmed its usefulness in guiding the analysis. Besides that, Thomé et al.'s (2012) conceptual S&OP building blocks appeared appropriate to reveal the practical S&OP application. An exemplar of S&OP CMOCs was presented to introduce a practical case of MRT theorising. Using the strategy of MRT, this paper is a first step to investigate the empirical studies' contribution to theorising in S&OP. However, the paper offers just the preliminary findings and has different limitations. Future research should, therefore, focus on all three dimensions of the framework.

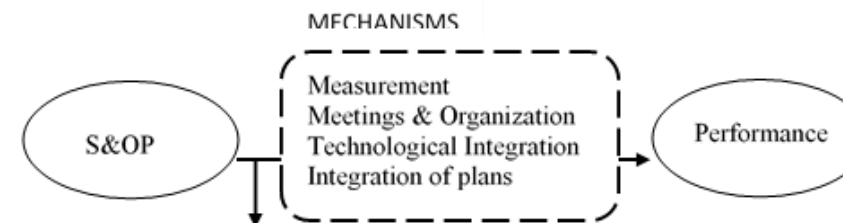
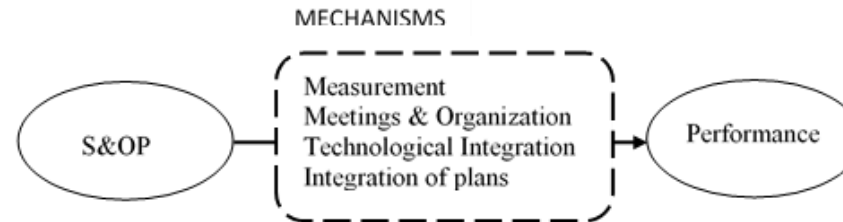
Regarding the first dimension, it is worth to identify other CMOCs, and to deeper investigate what works for whom, how, and under what circumstances, and thus take a further step towards middle-range theorising on S&OP. Concerning the second dimension, it would be valuable to study how S&OP is applied in real-life situations, by examining the adequacy or fit among the theoretical foundation, research design, and data collection methods. Another future research avenue would be to follow the third dimension of the framework, by investigating how S&OP bridges corporate and strategic plans to outcomes and results. The conceptual research synthesis framework could be extended for MRT theorising in other OM disciplines or supply chain integration approaches, such as Collaborative Planning, Forecasting and Replenishment.

Direct relationship: What - Mature S&OP improve firm operational performance (quality, flexibility, delivery) Thomé et al. (2014a, 2014b)



How does mature S&OP improve operational performance? Thomé et al. (2014a, 2014b)

- **Mechanisms:** (i) S&OP measurement (tracking and tracing, information sharing, real time information systems); (ii) meetings and organizations (cross-functional teams, concurrent engineering); (iii) technological integration (failure mode and effect analysis, quality function deployment); (iv) integration of plans (design, organizational and technical integration)



Under what circumstances does mature S&OP improve operational performance?

Rexhausen et al. (2012), Thomé et al. (2014a, 2014b)

CONTEXT: firm size, market dynamics, level of country development, transformation industry (Thomé et al., 2014a, 2014b), consumer products, raw materials, chemical, machinery, pharmaceutical and healthcare, high-tech, electronic, electrical equipment automotive, retail, and wholesale trade (Rexhausen et al., 2012).

Extension by Qi and Ellinger (2017): Why?

- Qi and Ellinger (2017) regroup S&OP antecedents under the conceptual framework of Organizational Orientation (Org. Or.): service, internal market, financial, and supply chain orientation.

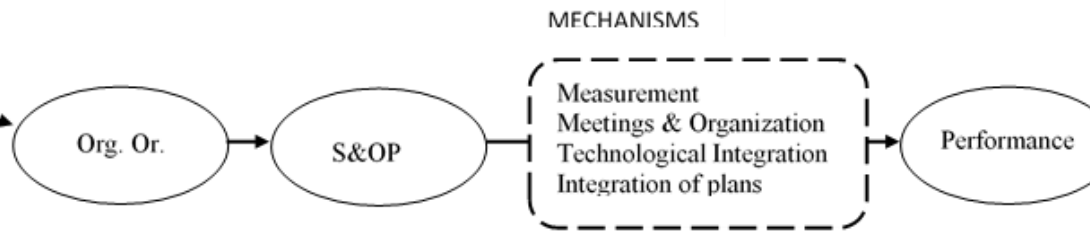


Figure 3 – S&OP mechanisms-context-outcome configuration (template adapted from Stank et al., 2017)

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