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Antecedents to effective sales and operations planning

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Abstract

Purpose – Sales and Operations Planning (S&OP) serves as the essential cross-functional process for organizations to match supply in the form of production, inventory, and procurement with customer demand. Given recent studies revealing that S&OP is ineffective for most firms, the purpose of this paper is to investigate the critical antecedents of effective S&OP.

Design/methodology/approach – Drawing on agency theory and stewardship theory, the authors develop and test a conceptual model that includes organizational integration, organizational priorities, standardized processes, and organizational engagement. The authors apply partial least squares structural equation modeling of survey data from S&OP practitioners to test the model.

Findings – The results confirm the relationships among S&OP antecedents. Organizational integration positively influences a standardized S&OP process, and both the S&OP process and prioritization lead to stronger organizational S&OP engagement. Ultimately, organizational S&OP engagement is positively linked to enhanced operational, market, and profitability outcomes.

Practical implications – The findings create a strong practical foundation for executing S&OP. The results also reveal a formal process for operationalizing the link between organizational integration and firm performance that is espoused but not detailed in existing literature.

Originality/value – Existing research supports the potential performance impacts of S&OP but has yet to validate how to specifically operationalize S&OP.

Keywords Sales and operations planning, Market orientation, Organizational integration, Supply chain orientation

Paper type Research paper

1. Introduction

Regardless of targeted strategic goals, desired performance outcomes such as market share, customer satisfaction, and profitability are ultimately driven by successful integrated planning and execution of supply and demand (Dougherty and Gray, 1987). Sales and Operations Planning (S&OP) represents the internal cross-functional process to tactically balance demand (forecast and sales) with supply (procurement, production, and distribution) while serving the organization's strategic plan (Feng *et al.*, 2008; Ivert and Jonsson, 2010; Thomé *et al.*, 2014a). In doing so, S&OP helps the organization overcome the silo effect wherein individual departments operate independently and often contradictory to one another. S&OP therefore represents a vital process for all businesses, coordinating and synchronizing processes such as demand planning, production scheduling, and supply management to improve forecasting accuracy, fill rates, customer satisfaction, and profitability (Ling and Goddard, 1988; Wallace and Stahl, 2008).

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Despite its importance, S&OP has largely been overlooked in existing literature (Grimson and Pyke, 2007; Tuomikangas and Kaipia, 2014). Most operations and supply chain research still focusses on individual processes (e.g. forecasting, production planning) without considering the interaction of these functions needed to coordinate supply and demand. Despite the sophistication of research in interfirm supply chain integration (Daugherty, 2011), literature addressing such intrafirm integration requires significant further development to sufficiently consider the breadth and complexity of organizational integration and subsequent effects on performance (Frankel and Mollenkopf, 2015; Rosado Feger, 2014; Swink and Schoenherr, 2015; Turkulainen and Ketokivi, 2012). Existing research often models a direct relationship between integration and performance without developing intermediary processes needed to operationalize the integration. S&OP represents one such process. Yet, the few recent studies that do investigate coordination of sales and operations lack holistic assessment of the entire S&OP process, and limited studies empirically test the components of the S&OP process and subsequent effects on firm performance (Thomé *et al.*, 2014b; Tuomikangas and Kaipia, 2014).

Consequently, Tuomikangas and Kaipia (2014) identify empirical S&OP studies as a major research opportunity, finding that S&OP challenges from practice are virtually ignored in academic literature. This dearth of S&OP research has neglected the needs of industry, stopping short of fully divulging antecedents for implementing S&OP. As such, industry literature reveals current pervasive S&OP ineffectiveness in improving operations, sales, and profitability (Barrett and Steutermann, 2010). So, despite the elementary, evident objectives of S&OP, existing research ultimately fails to validate the S&OP process or explain the reasons for S&OP ineffectiveness. The research herein attempts to help fill this gap by validating the antecedents of effective S&OP, including the relationship among these antecedents:

RQ1. What are the antecedents leading to effective S&OP?

RQ2. What are the relationships among these S&OP antecedents?

To study these questions, we develop a conceptual model with theoretical support from existing literature for construct development and survey scales. The model includes organizational integration, a standardized S&OP process, S&OP prioritization, and organizational engagement. We test the model with survey data from S&OP practitioners. The results fill the above research gap to empirically test S&OP antecedents to provide industry with a more detailed, thorough roadmap of how to both implement and benefit from S&OP. The results also provide a springboard for academia to further fill the gap with additional research.

2. S&OP

Organizations must consistently meet customer expectations. The marketing concept elevates customers as the focal point to unite marketing activities with all organizational functions (Felton, 1959). Kohli and Jaworski (1990) propose the term market orientation to reflect how every employee must become customer-centric in their specific job duties (Fugate *et al.*, 2008), representing reduction of traditional departmental boundaries and emergence of cross-functional integration (Jaworski and Kohli, 1993; Kirca *et al.*, 2005). Still, cross-functional integration, including links with operations and supply chain, is difficult to achieve given independent and sometime adversarial departments in the organization. Limited coordination between sales and operations leads to isolated decisions where one functional area benefits at the expense

of another (Grimson and Pyke, 2007). This silo effect leads to demand and supply mismatches (Esper *et al.*, 2010), impelling inter-departmental connectedness as a key antecedent for market orientation (Jaworski and Kohli, 1993; Kirca *et al.*, 2005).

In response, supply chain orientation creates prospects for increased intrafirm integration with processes that cross-internal functional boundaries (Mentzer *et al.*, 2008; Min *et al.*, 2007). Green *et al.* (2006) show how supply chain orientation mediates the relationship between market orientation and firm performance, suggesting an intermediate step that includes inter-departmental planning to manage the flow of information, materials, products, and services through the organization to customers (Fugate *et al.*, 2008; Kohli and Jaworski, 1990; Mentzer *et al.*, 2008). Still, Mentzer and Gundlach (2010) and Pero and Lamberti (2013) observe limited capabilities to manage the market orientation-supply chain interface.

S&OP represents the organizational process to integrate internal resources to balance market and supply orientations to simultaneously achieve desired customer satisfaction and organizational goals (Ling and Goddard, 1988). Schmalz and Williams (2005) characterize S&OP as a unified decision-making process involving top management, sales/marketing, operations, and accounting/finance to support company goals through development of a single operational, sales, and financial plan. S&OP thereby supports the organization's ability to effectively respond to demand and supply variability.

While the importance of S&OP is clear if not seemingly rudimentary, existing research maintains that S&OP has yet to fulfill its promise (Thomé *et al.*, 2012; Tuomikangas and Kaipia, 2014). Practitioner studies indicate that most firms using S&OP neither fully execute the process nor achieve desired results (Muzumdar and Fontanella, 2006; Smith, 2008). For example, Barrett and Steutermann (2010, p. 1) found poor overall S&OP performance capabilities, adding that "Although S&OP is nearing its second decade, only 18% of companies rate themselves as proficient. Worse, year-over-year data shows that industries are going backward, not forward."

The antecedents leading to effective S&OP have yet to be identified. Aside from overview papers (Grimson and Pyke, 2007; Thomé *et al.*, 2012; Tuomikangas and Kaipia, 2014), a case study (Oliva and Watson, 2011), and a few tangential quantitative papers (e.g. Feng *et al.*, 2010), there is a dearth of existing research identifying and validating S&OP antecedents (Thomé *et al.*, 2014b). Both conceptual and empirical S&OP research thus remains highly incomplete and has failed to serve industry with rigorous investigation of the S&OP process and underlying success factors. Consequently, the purpose herein is to develop and empirically test a theoretically based model to identify antecedents of effective S&OP.

3. Constructs and hypotheses

The proposed research model (Figure 1) seeks to validate how S&OP antecedents systematically link organizational integration to firm performance. Drawn from

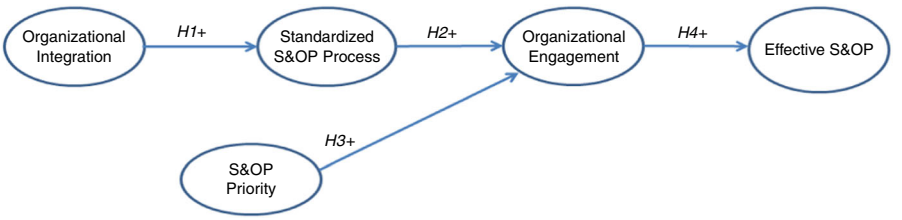

Figure 1.
Research model

existing S&OP practitioner literature (Ling and Goddard, 1988; Wallace and Stahl, 2008) as well as from agency theory and stewardship theory (Davis *et al.*, 1997; Eisenhardt, 1989), the model constructs include organizational integration, a standardized S&OP process, S&OP priority, and organizational engagement with effective S&OP performance as the dependent variable. Implicit in the model is a departure from individual self-interests (inherent in agency theory) given advancement of organizational interests, most notably agreement on common goals and mutual obligations (the essence of stewardship theory).

The model proposes that organizational integration is positively related to a standardized S&OP process (*H1*), and in turn, both S&OP process (*H2*) and priority (*H3*) are positively related to organizational engagement in S&OP. Ultimately, organizational engagement in S&OP is positively linked to effective S&OP (*H4*) in the form of organizational performance (Grimson and Pyke, 2007). The intermediary S&OP constructs (process, priority, and engagement) fully mediate the link between organizational integration and performance, thus establishing S&OP as the critical process to operationalize integration. We next develop the construct definitions (Table I) and the associated research hypotheses.

3.1 Construct development

Organizational integration synthesizes collaborative interactions to reconcile functional specialization (Kahn and Mentzer, 1996). Lawrence and Lorsch (1967) posit that task differentiation and integration are necessary to avoid short-term conflicts and emphasize long-term corporate goals (Shapiro, 1977; Oliva and Watson, 2011). Next, a standardized S&OP process represents a systematic methodology grounded in stable, predictable procedures. Quality pioneers Shewhart (1931) and Deming (1986) maintain that organizations can reduce uncertainty and disruptions by following standardized,

Construct	Definition	Critical elements	References
Organizational integration	Collaboration, effective interactions to reconcile functional specialization and effort coordination	Cross-functional teams; joint decision making; participative strategy setting	Kahn and Mentzer (1996) and Lawrence and Lorsch (1967)
Standardized S&OP process	Systematic methodology grounded in formal strategies/ tactics and stable procedures	Policies and procedures; timely meeting agenda and minutes; relevant and reliable data	Deming (1986), Ling and Goddard (1988) and Shewhart (1931)
S&OP priority	Importance designated for corporate initiatives	Organizational priority; executive and top management involvement	Fiegenbaum *et al.* (1996), Steers and Porter (1974) and Strong (2000)
Organizational engagement	Active employee involvement, commitment to organizational initiatives	Participation; accountability; process ownership; process improvement	Hall and Ferris (2011) and Zuzana and Krupkova (2013)
Effective S&OP	Reliance on S&OP as key process to balance demand and supply	Improvements in forecasting accuracy, inventory turnover, on-time delivery, etc.	Grimson and Pyke (2007)

Table I.
Research constructs

explicit processes that produce predictable, repeatable results. Such processes are more efficient and easier to manage.

S&OP priority designates the level of importance for corporate initiatives (Fiegenbaum *et al.*, 1996). Steers and Porter (1974) identify organizational benefits from desired employee behaviors when top management supports and prioritizes goals as well as maintains involvement in the process. Similarly, organizational engagement in S&OP reflects participation in meetings, accountability, work objective acceptance, and process ownership. Active involvement is also signified by commitment to organizational initiatives and process improvement (Hall and Ferris, 2011). Finally, the dependent variable, effective S&OP implementation, characterizes the potential performance impacts of successful S&OP execution. As purported by both practitioner and academic literature, S&OP execution directly yields improvements in not only profitability and sales but also forecasting accuracy, inventory turnover, and on-time delivery (Grimson and Pyke, 2007). With this, the construct represents performance outcomes frequently applied in cross-functional integration research (Swink and Schoenherr, 2015).

3.2 Hypotheses development

Existing practitioner guidelines, particularly from Ling and Goddard (1988) and Wallace and Stahl (2008), provide directional yet no empirical support for the relationships between the antecedents in the research model. We now provide theoretical support. In first establishing the link between organizational engagement and a standardized S&OP process (*H1*), agency theory posits that conflicts in goals and differences in risk tolerance among principals leads them to act in self-interest, in this case not necessarily for organizational objectives (Eisenhardt, 1989). Pursuant to stewardship theory, the integration-orientation of S&OP aligns such interests (Davis *et al.*, 1997). Lapide (2004) argues that greater functional interdependence of S&OP expected in an established S&OP process improves coordination and communication. Grimson and Pyke (2007) illustrate how standardized S&OP processes are enabled when functional silos are replaced by personnel working together toward a common goal. Consequently:

H1. A higher level of organizational integration will lead to a higher level of standardized sales and operations processes.

Examining *H2* (S&OP process and organizational S&OP engagement), the previous agent vs steward argument again applies. The standardized S&OP process with joint, coordinated objectives and performance metrics requires a stewardship orientation within the organization, and the S&OP process and engagement serve to minimize agent self-interested action. Existing literature reveals that stable and predictable processes improve employee action toward production efficiency and disruption response (McConnell *et al.*, 2011). Specific to S&OP, Grimson and Pyke (2007) and Esper *et al.* (2010) argue that established processes grounded in regular meetings, performance metrics, and formal team structures support advanced S&OP characterized by high levels of organizational engagement. Following this logic, we maintain that standardized S&OP procedures must exist to operationalize organizational integration for S&OP engagement. We thus position standardized S&OP to fully mediate organizational integration and to exist as a necessary condition for organizational engagement:

H2. A higher level of standardized sales and operations processes will lead to a greater level of organizational engagement in S&OP.

Like *H2*, S&OP priority also serves to reduce the agent perspective by clarifying the importance of coordinated S&OP outcomes over independent, divergent objectives of each department. Consequently, *H3* (S&OP priority and S&OP engagement) posits that organizations can facilitate desired levels of engagement, a common factor impacting individual behavior, with clear alignment of organizational priorities and persistent communication (Gohari *et al.*, 2013; Xu *et al.*, 2014). Organizational priorities from management communication and actions have thus been denoted as critical reference points to create signals or benchmarks to employees (Barney, 1991). S&OP priority thus emphasizes the importance of organizational engagement in S&OP such that:

H3. A higher level of organizational priority for S&OP will lead to a greater level of organizational engagement in S&OP.

Finally, *H4* relates organizational S&OP engagement, stewarding the outcomes of effective S&OP that are most critical to the entire organization and not one individual department. This hypothesis operationalizes the underlying S&OP motivation to enhance financial and operational performance through matching supply and demand to meet customer expectations (Grimson and Pyke, 2007). Similarly to *H2*, we posit a full mediation role for organizational engagement and both standardized S&OP processes and S&OP priority as related to effective S&OP. In other words, neither a standardized S&OP process nor S&OP priority alone will lead to effective S&OP. Thus:

H4. A higher level of organizational engagement in S&OP will lead to a greater effectiveness level for S&OP.

In the above research hypotheses, we emphasize omission of a direct link from organizational integration to firm performance as established in existing cross-functional integration literature. We maintain that the S&OP constructs represent intermediary steps to fully mediate the relationship between integration and performance. Supporting this notion, Swink and Schoenherr (2015) demonstrate that internal integration creates process efficiencies to enable firm performance.

4. Methods

We tested the hypotheses via a survey of management-level practitioners who currently and regularly participate in S&OP meetings. Measures for all independent variables used a seven-point Likert scale (very unlikely to very likely) developed from existing scales to measure respondents' personal perspectives of S&OP antecedents. Table IV details the entire survey. Organizational integration reflects items from Germain and Dröge (1997) and Germain *et al.* (2001), while items for standardized processes, S&OP priorities, and organizational engagement were drawn from Wallace and Stahl (2008). Finally, the dependent variable, effective S&OP, relied on a ten-point scale ranging (very low improvement to very high improvement) and was measured by improvements in revenue, profitability, forecasting accuracy, on-time delivery, inventory turnover, and other measures expected to result from S&OP (Grimson and Pyke, 2007). This latter ten-point scale with reduced wording was used to minimize respondent fatigue (Krosnick and Presser, 2010).

The survey was pre-tested with eight S&OP practitioners to refine survey phrasing and ordering. Survey questions were ultimately sequenced to increase construct discriminant validity and minimize common method variance (Podsakoff *et al.*, 2003). For instance, effective S&OP items were positioned at the beginning, and exogenous variables items were asked later. As confirmation, a Harman one-factor analysis

yielded the absence of a single factor, and no general factor accounted for the majority of the variance (Podsakoff *et al.*, 2003).

S&OP sampling remains challenging since the process reaches across different organizational departments and no single professional institution exists to specifically support S&OP. Thus, we had to cast a broad net to find professionals actively practicing S&OP. The Institute of Management Accountants and the Institute of Business Forecasting provided contact lists of potential respondents. Any one particular contact may or may not be involved in S&OP, so respondents were pre-qualified with a screening question to ensure that they regularly participated in S&OP.

To obtain the desired sample size, the survey was distributed via the internet to 2,690 participants in the USA and Canada via an on-line survey tool. Participants first received an e-mail introducing the research objectives, requesting their participation, and providing a link to the survey. We followed up two weeks later with a reminder then a final reminder the ensuing week. The 9.4 percent response rate (252 respondents) is typical for electronic surveys (Shih and Fan, 2008). After adjusting for respondents not regularly participating in S&OP meetings and responses with missing data (Hair *et al.*, 2010), the usable dataset included 178 respondents.

Table II displays respondent demographics. 50.3 percent of respondents had between one and five years' experience with S&OP, while 17.3 percent had more than ten years. In total, 55.9 percent of respondents were employed in indirect (non-operations) positions (e.g. S&OP support, consulting, accounting/finance). In total, 46.9 percent of the respondents worked in manufacturing industries, and 53.1 percent worked in non-manufacturing industries (e.g. retail/wholesale, healthcare, services). Firm sizes ranged from less than 1,000 employees to more than 50,000. ANOVA analysis indicated no differences in responses across the different demographics, revealing the diverse adoption of S&OP and the broad applicability of the survey.

Position	% Respondents	Industry	% Respondents	Firm revenue	% Respondents
Operations executive/manager	44.1	Manufacturing	53.1	< $50 million	18.4
S&OP support (consultant, IT, etc.)	35.8	Retail/wholesale	12.3	$50-$100 million	7.8
CFO/accounting manager	12.8	Healthcare	7.3	$101-$500 million	17.9
CEO/president	4.5	Services	3.9	$501 million-$1 billion	14.0
Marketing executive/manager	2.8	IT	3.4	$1-$5 billion	20.1
		Other (e.g. mining, utilities, transport)	20	> $5 billion	21.8
S&OP experience	% Respondents	Firm employees	% Respondents		
< 1 year	10.1	Under 1,000	36.3		
1-5 years	50.3	1,000-5,000	26.3		
6-10 years	22.3	5,001-10,000	12.3		
> 10 years	17.3	10,001-50,000	13.4		
		More than 50,000	11.7		

Table II. Respondent demographics

4.1 Structural modeling

The research model was tested with partial least squares structural equation modeling (PLS-SEM), which is particularly applicable in theory development like that herein (Hair *et al.*, 2011). We adhered to the PLS-SEM model assessment process outlined by Hair *et al.* (2014) and Ringle *et al.* (2012), first evaluating the measurement model then the structural model. Table III identifies descriptive and correlation statistics. Multicollinearity was not a concern given variance inflation factors and tolerances for independent variables within acceptable ranges of 5 or less and greater than 0.2, respectively (Hair *et al.*, 2011).

The measurement model incorporates model reliability as well as convergent and discriminant validity. As indicated in Table IV, three scale items were removed due to low-factor loadings, which *post hoc* seem to originate from unclear wording not discovered in pre-testing (Hair *et al.*, 2010, 2011). Convergent reliability was established with construct composite reliabilities all exceeding 0.70 (Hulland, 1999) and latent variables each explaining more than half of indicator variance (Fornell and Larcker, 1981). Examining discriminant validity, the average variance extracted, ranging from 0.60 to 0.82, exceeded all squared correlations with other constructs, and item loadings, ranging from 0.86 to 0.89, exceeded loadings for other constructs (Hair *et al.*, 2011).

To evaluate the structural model, PLS-SEM uses a non-parametric bootstrapping procedure to assess factor loadings and path significances rather than the goodness-of-fit measures in traditional covariance-based SEM (Hair *et al.*, 2011). Evaluating the hypothesized paths of the structural model (Figure 2), f^2 effect sizes are strong for organizational integration (0.66), standardized process (0.42), and priority (0.46), though the model R^2 (0.22) is considered low (Hair *et al.*, 2011). Assessing the model predictive relevance, Q^2 scores for all seven iterations (0.056-0.462) acceptably exceed 0 (Hair *et al.*, 2011). Using the PLS-SEM non-parametric bootstrapping process to determine significance levels (Hair *et al.*, 2011, 2014), all paths are significant at 0.001, thus supporting *H1-H4*.

We followed Baron and Kenny (1986) to assess conditions for full mediation for organization integration (mediated by S&OP process to organization engagement), S&OP process (mediated by organizational engagement to effective S&OP), and S&OP priority (mediated by organizational engagement to effective S&OP). The approach evaluates correlations between the exogenous, mediating, and endogenous variables and demonstrates full mediation if the relationship between the exogenous and endogenous variables is insignificant after the mediator is added. Using the bootstrapping procedure in PLS-SEM, the conditions held for all three proposed mediated relationship, verifying full mediation.

	Mean	SD	1	2	3	4	Tol	VIF
1. Organizational integration	5.13[a]	1.08					0.67	1.50
2. Standardized processes	5.03[a]	1.10	0.55***				0.52	1.92
3. Organizational priority	4.57[a]	1.43	0.31***	0.37***			0.56	1.77
4. Organizational engagement	5.34[a]	1.07	0.46***	0.62***	0.66***		0.38	2.67
5. Effective S&OP	5.80[b]	1.72	0.31***	0.33***	0.29**	0.43***	0.80	1.25

Table III.
Descriptive statistics

Notes: [a]Scale 1-7; [b]scale 1-10. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Item		Loading	Reliability	AVE
Organizational integration[a]			0.83	0.74
OI1	Our organization uses cross-functional teams for our long-term processes	0.87		
OI2	Personnel from different departments regularly come together to make decisions on key business activities	0.86		
OI3	Our organization uses a participative approach to determine our supply/demand strategy	Removed		
OI4	Cross-functional teams frequently review supply/demand plans	0.85		
OI5	Our organization is characterized by joint decision making	0.85		
Standardized S&OP processes[a]			0.86	0.55
PRO1	We review all key supply/demand data and plans at our S&OP meeting	0.72		
PRO2	We follow a policy and procedure during our S&OP meetings	0.81		
PRO3	A written agenda is issued at least three business days before our S&OP meeting	0.73		
PRO4	Minutes of our S&OP meeting are distributed within three business days of the meeting's conclusion	0.73		
PRO5	We have the data and information we need to make decisions at our S&OP meeting	0.68		
PRO6	Our S&OP meeting differs from an organizational financial review as we focus more on demand/supply processes	Removed		
Organizational priority[a]			0.83	0.62
PRI1	The S&OP process has at least equal priority with all organizational initiatives and programs	0.75		
PRI2	If the CEO/president/general manager is unable to attend, the S&OP meeting is rescheduled	0.74		
PRI3	The CEO/president/general manager oversees/chairs the S&OP meeting	0.86		
Organizational engagement[a]			0.83	0.62
OE1	It is mandatory for the entire top management team to participate in a regularly scheduled S&OP meeting	0.70		
OE2	Each top management team member "owns" the information discussed in the S&OP meeting related to his/her area	0.82		
OE3	Department personnel as appropriate, have work objectives to support S&OP	0.74		
OE4	Each top management team member is held accountable for action items assigned at the S&OP meeting	0.81		
OE5	We regularly review our S&OP processes to identify improvement opportunities	0.63		
Effective S&OP[b]			0.89	0.53
S1	Improvement made in […] demand forecasting accuracy	0.64		
S2	Sales revenue	0.77		
S3	New product introductions	0.60		
S4	Profitability	0.83		
S5	Inventory turnover	0.71		
S6	On-time delivery	0.78		
S7	Capacity utilization	Removed		
S8	Fewer expedited orders	0.74		

Notes: [a]Seven-point Likert scale ranging from very unlikely to very likely; [b]ten-point scale ranging from very low improvement to very high improvement

Table IV. Measurement model results

5. Discussion and implications

The results confirm the antecedents of effective S&OP (*RQ1*) and the relationships between these antecedents (*RQ2*). Specifically, organizational integration (*H1*) positively influences a standardized S&OP process, and both the S&OP process (*H2*) and priority (*H3*) lead to stronger organizational engagement in S&OP. Ultimately, organizational engagement (*H4*) is positively linked to S&OP success, assessed by enhanced operational and financial outcomes. The relationships demonstrate the proposed full mediation.

Given that we present an initial empirically tested model of S&OP in contrast to heuristics and ad hoc guidelines provided by extant literature to date, the findings not only create a strong foundation for better understanding S&OP effectiveness but also highlight the importance of S&OP to organizational performance. Systematic implementation of the S&OP antecedents can produce tangible performance effects, confirming the importance of S&OP and the organization's ability to execute it effectively. This research provides practitioners with a grounded foundation to better realize the promise of S&OP. The diverse response base with respect to position, industry, and firm size suggests that the results should be broadly generalizable.

5.1 Managerial implications

From a managerial perspective, the importance of balancing supply and demand for global supply chains remains high given challenges from supply and logistics disruptions, complex omni-channel distribution networks, cost reduction pressures, JIT delivery schedules, shorter product lifecycles, and SKU proliferation. S&OP helps to address such challenges, minimizing expedites, and stockouts while improving reaction to demand shifts without excessive inventory. The results and insight contained herein encouragingly provide a path forward for organizations to better understand the process requirements needed to recognize the full potential of S&OP. In other words, the results, including the mediated effects, confirm a step-by-step process to manage variable demand and supply to drive firm performance.

H1 reveals the starting point in organizational integration, impelling firms to proactively apply methods to increase communication and cooperation across departments. Cross-functional teams provide such a foundation. Additional tools could include employee cross-training and job rotations across different departments, hands-on site visits at production facilities, and co-locating and intermingling different departmental employees in the same physical location.

H2 and *H3* present potential concurrent steps of establishing a formal S&OP protocol (*H2*) and solidifying S&OP importance within the organization (*H3*). S&OP therefore requires a documented process flow across departments, including timing, roles, and

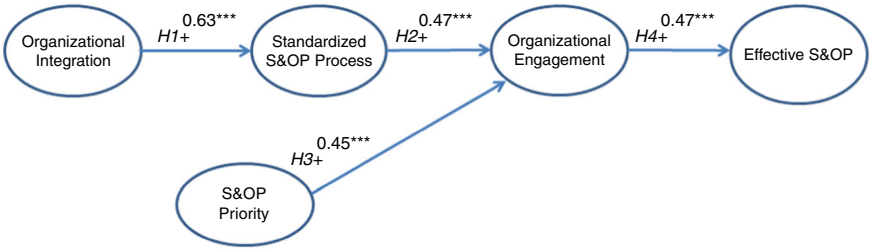

Figure 2.
Structural model results

Notes: *$p<0.05$; **$p<0.01$; ***$p<0.001$

responsibilities for 18 months or more horizon. Additional specific elements incorporate data flows (e.g. ERP systems), conflict resolution procedures, analytical tools for what-if scenario planning, detailed S&OP meeting agendas, and timely S&OP meeting documentation distribution. Furthermore, the core S&OP outputs of consensus demand and supply plans must be developed in coordination with the organization's financial plan.

Top leadership support for S&OP must be clear and strong to maintain the prominence of S&OP relative to other organizational initiatives. Wallace and Stahl (2008) vigorously maintain that organizational executives must "own" the S&OP process, creating a specific sub-process of "Executive S&OP" to crystallize their point. Leadership must actively and visibly participate in the S&OP process and maintain the discipline of all departments to do so as well. They must set goals to formalize the cross-functional performance metrics established in the effective S&OP survey construct, monitor the metrics with dashboards and reporting, and tie outcomes to managerial incentives and performance reviews.

Organizational engagement (*H4*) finalizes the capability to successfully execute S&OP. Work objectives as well as task and data accountability are tied directly to the S&OP process. DMAIC projects through Six Sigma, kaizen, and benchmarking combined with employee training can further strengthen the S&OP process and underlying engagement. The results also establish the breadth of important performance outcomes from S&OP related to not only operational benefits such as forecast accuracy, delivery reliability, and inventory turnover but also financial benefits in profitability and sales revenue. This supports industry S&OP champions like Ling and Goddard (1988) and Wallace and Stahl (2008) who maintain that S&OP forms the basis for complete organizational success.

5.2 Research implications

The research findings are also important given several gaps in existing literature. First, despite S&OP's importance and potential impact for organizations, extant literature remains relatively limited. Practitioners have published "how to" materials on S&OP implementation, yet academic literature has not empirically validated the process and antecedents. The limited successful implementation identified in practitioner literature discussed earlier urges empirical support. Consequently, the research herein represents some of the initial work to do so, empirically confirming the antecedents for effective S&OP and therefore setting a foundation for additional research in S&OP.

Equally important, existing literature promotes the significance of integration within the firm but surprisingly stops short of providing specific validated tools and processes to support intrafirm integration (Frankel and Mollenkopf, 2015; Swink and Schoenherr, 2015). S&OP represents one such tool, and the antecedents verified in this paper provide details of how to operationalize S&OP to integrate the organization. As S&OP fully mediates the link between organizational integration and performance in the research model, it becomes the underlying formal process to assimilate the organization to balance supply and demand to drive performance.

Finally, market orientation, a focus for all employees to satisfy customer needs, is highly researched and promoted in marketing literature. Existing operations and supply chain literature has provided some evidence of the importance of market orientation but has not thoroughly validated its extension from the demand side to the supply side of the organization. S&OP represents the process to enable this connection. The research thus helps to fill this gap in the literature as well as set underpinnings for additional work to strength the operational side of the market orientation.

6. Limitations and future research

Overall, the research results provide a strong start to empirically identify the antecedents of effective S&OP. Yet limitations apply. Inherent to survey research, the results hold only for the collected sample, so we encourage expanded international S&OP data collection to assess commonalities and differences. Researchers could also differentiate S&OP antecedents across industries (e.g. manufacturing vs service, short vs long product lifecycles) and firm size. Given S&OP's cross-functional nature, an advanced application could target specific organizational roles to distinguish how participants view S&OP antecedents depending on their responsibilities and influence. In a similar vein, it would be interesting to benchmark S&OP best practices by segmenting respondent firms by S&OP maturity, allowing contrasting models of leaders vs laggards. Likewise, longitudinal data could assess the progression of S&OP antecedents as the organization builds S&OP competence.

The research model herein was relatively parsimonious, so additional variables could enhance predictive relevance (Thomé *et al.*, 2014a). Constructs such as training, change management, and the presence of other coordinating initiatives (e.g. ERP, Lean) could explain greater levels of model variance (Hsu and Chen, 2004). Process antecedents could also be extended to include planning systems as well as collaboration with suppliers and customers (Hadaya and Cassivi, 2007). Furthermore, collection of secondary data for objective performance measures could further solidify the model, and additional performance outcomes could be considered, including organizational innovation and customer satisfaction (Simon *et al.*, 2014). As a final research opportunity, future research could incorporate decision biases that lead to inaccurate inferences during the S&OP process given recent calls to consider behavioral impacts in operations (Gino and Pisano, 2008).

7. Conclusion

Ultimately, S&OP requires greater inquiry to harness its potential. Organizations can only sustain performance outcomes such as market share and profitability by effectually coordinating internal processes to consistently deliver what customers want. As such, S&OP represents the critical process to balance demand and supply, therefore serving as the decisive approach to increase control and agility of the business by synchronizing key organizational activities such as sales planning, new product introduction, quality management, capacity planning, and supply management. The strong model results held despite respondents from a variety of industries, implying that S&OP permeates all organizations. With such significance, we urge researchers to consider S&OP as a foundation for examination of all operations and supply chain processes to drive cross-functional integration and extend the customer focus of the market orientation deep into the organization.

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