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Review

A coordination framework for sales and operations planning (S&OP): Synthesis from the literature

Nina Tuomikangas *, Riikka Kaipia [1]

Aalto University School of Science, Department of Industrial Engineering and Management, P.O. Box 15500, FI-00076 Aalto, Finland

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ABSTRACT

Sales and operations planning (S&OP) is a key business process to match customer demand with supply capabilities in the medium term. Coordination mechanisms play a pivotal role within S&OP to align business strategy and operational planning as well as the involved business functions and supply chain partners. The aim of this research is to synthesize a framework of coordination mechanisms in S&OP from both academic and practitioner literature, and to derive perspectives for further research. For this purpose, a sample of 99 articles from three databases covering the years 2001–2013 is selected and analyzed from two different perspectives. First, following a top-down approach, we use a general conceptual framework of coordination mechanisms to analyze and map the literature. Second, using a bottom-up concept-centric approach, we identify six relevant coordination mechanisms for S&OP: the S&OP process, S&OP organization, S&OP tools and data, performance management, strategic alignment, and S&OP culture and leadership. Synthesizing the two perspectives, we emphasize the tactical role of S&OP as a means of linking company strategy and operational planning, as well as the importance of creating a specific leadership style and culture in the organization. The major avenues for further research are identified: S&OP being a complex phenomenon, research would benefit from empirical studies, particularly from in-depth case studies with multiple perspectives, in order to provide a deeper understanding and guidelines for companies to manage the implementation challenges. Furthermore, S&OP can serve as a powerful tool for reaching business targets, a view that is mostly absent from the current literature and thus deserves more attention from the academic community.

Contents

* Corresponding author. Tel.: +358 40 5641472.
E-mail addresses: nina.tuomikangas@aalto.fi (N. Tuomikangas), riikka.kaipia@aalto.fi (R. Kaipia).
[1] Tel.: +358 50 3684759; fax: +358 9 4702 3665.

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1. Introduction

Sales and operations planning (S&OP) is the key business process to balance customer demand with supply capabilities. The general objective of S&OP is matching demand and supply in the medium term, by providing an instrument for the vertical alignment of business strategy and operational planning, and for the horizontal alignment of demand and supply plans (Feng et al., 2013; Wagner et al., 2014). S&OP performs coordination, taking two perspectives. The organizational perspective covers cross-functional intracompany and supply chain intercompany coordination, while the planning/process perspective covers coordination of material, financial, and information flows. As such, S&OP keeps an essential role in realizing supply chain management, performing the task of integrating organizational units along a supply chain, in order to fulfill customer demand with the aim of improving competitiveness as a whole (Stadtler, 2005). Globalization, market uncertainty and increasing supply chain complexity raise further challenges for coordination (Laurent Lim et al., 2014).

Coordination mechanisms play a pivotal role within S&OP in aligning business strategy and operational planning, as well as aligning the involved business functions and supply chain partners. Coordination is the pattern of decision making and communication among a set of actors who perform tasks to achieve common goals (Malone, 1987). In supply chains, coordination is realized when the actors make decisions that are efficient for the supply chain as a whole (Crowston, 1997; Gupta and Weerawat, 2006). In S&OP, the decisions about production and purchase quantities to meet demand require coordination of company functions as well as of autonomous supply chain partners (Schneeweiss, 2003a, 2003b). Coordination, here understood as a synonym for integration, facilitates collaboration, as it connects specialized functional areas, such as sales, marketing, finance, and operations, as well as the strategic, operational, and tactical levels of planning. Coordination mechanisms, in turn, are the variety of tools and practices managers can use to connect functional areas and planning levels (Martinez and Jarillo, 1989). S&OP is expected to serve as a communication and decision making process that addresses volume and product mix and the company's key resources (Dougherty and Gray, 2006; Palmatier and Crum, 2003; Xu et al., 2009). A further benefit of S&OP is the support for the tactical planning level and thus it links strategic planning to operational planning (Affonso et al., 2008; Wallace, 2011) by uniting plans into one integrated set of numbers (Chen-Ritzo et al., 2010; Ivert and Jonsson, 2010).

S&OP is enjoying a high and growing managerial interest. Even though the S&OP process appears easy to understand, companies face difficulties in realizing the expected benefits (Bower, 2005; Lapide, 2004; Piechule, 2008). Furthermore, the literature only provides limited understanding of how S&OP can be used to improve firm performance (Thomé et al., 2012b). This indicates that companies lack guidelines and advice about how to actually implement S&OP in order to facilitate coordination across functions and organizations. As coordination mechanisms are the tools that managers have at their disposal to enable integration (Martinez and Jarillo, 1989), it is essential to understand how these tools need to be selected and used to achieve coordination. This has been appreciated in literature, where a call for increased understanding of coordination mechanism selection has been made (Whang, 1995; Pagell, 2004). In the field of operations management there is a prevailing understanding that well-performing relationships between company functions, as well as between companies, enhance firm performance (e.g., Flynn et al., 2010; O'Leary-Kelly and Flores, 2002; Swink et al., 2007) and that internal coordination between functions is considered a prerequisite for intercompany coordination in supply chains (Mentzner and Moon, 2004). In the context of S&OP, the understanding on coordination mechanisms remains low. In contrast to previous literature reviews on S&OP (Singhal and Singhal, 2007; Thomé et al., 2012a, 2012b), which studied the literature from the performance viewpoint, the current paper studies the S&OP literature from a coordination viewpoint, and synthesizes it into a form of an S&OP coordination framework.

The phenomenon studied in this paper is S&OP as an important tool fostering coordination between functions and organizations, as well as between strategic and operational planning. The purpose of the paper is to provide a framework of coordination mechanisms in the context of S&OP. This is achieved by studying how cross-functional and intercompany coordination is treated in the S&OP literature and which coordination mechanisms the literature deals with and how. The approach used is a systematic literature review, which is presented in detail in Section 2. Thereafter, Section 3 presents the descriptive and thematic results from the literature review. The results are synthesized and the S&OP coordination framework is formed and presented in Section 4. At the end of the section, the paper identifies areas for further research from the viewpoint of coordination. Finally, conclusions are presented in Section 5.

2. Approach and methodology

The research approach and methodology are presented in this section. The systematic literature review process is described in detail in Section 2.1, the methods used to increase the validity and reliability of the research are presented in Section 2.2 and the purpose and the development of the conceptual framework of coordination mechanisms are presented in Section 2.3.

2.1. Conducting the literature review

In order to ensure a replicable, scientific and transparent approach, the systematic literature review process outlined by Denyer and Tranfield (2009) was adopted. A systematic literature review aims to minimize bias through extensive literature searches of published and unpublished studies and by providing an audit trail of the reviewers' decisions and conclusions. Systematic literature reviews are, hence, more likely than traditional literature reviews to produce unbiased and comprehensive accounts of the literature.

In this study we follow a 5-step process that includes (i) question formulation, (ii) locating studies, (iii) study selection, (iv) analysis and synthesis, and (v) reporting and using the results. These five steps are presented next.

2.1.1. Question formulation

First, research questions were formulated to provide focus and guidance in defining which studies should be included in the review. To avoid a limited view, the questions were formulated to cover multiple aspects of coordination, including horizontal coordination across functions, as well as vertical coordination between strategic, tactical and operational management and planning levels inside an organization, and, furthermore, across organizations. The following three primary questions were set:

- **Research question 1**: How is coordination treated in the sales and operations planning (S&OP) literature?
- **Research question 2**: How can coordination mechanisms be synthesized into a coordination framework in the context of S&OP?
- **Research question 3**: Which aspects of coordination in the context of S&OP require more attention in academic research?

2.1.2. Locating studies

Locating studies, the second step, aims to select and appraise as much as possible of the research relevant to the research questions (Denyer and Tranfield, 2009). Three databases were selected for the search: EBSCO Business Source Complete, Emerald, and Science Direct Elsevier. These databases cover the majority of scientific journals of interest in the spheres of operations management, organizational management, and the social sciences (Thomé et al., 2012b). The following keywords were used in the search engine: "sales and operations planning" OR "S&OP". The keywords were required to be included in the abstract, title, or article keywords, in order to include articles that focus on S&OP and to exclude articles that mention S&OP only briefly. The search was performed in two stages: the first search was conducted on August 5th 2012 without limitation with regard to the publication year in the search criteria. The second search was conducted on February 5th 2014, in order to extend the analysis to cover the full years 2012 and 2013.

In addition to the database searches, the tables of contents of a set of key journals were also reviewed in order to capture any S&OP-related articles outside the database search. The following journals focusing on production, operations management, logistics, and supply chain management with an ISI impact factor higher than 1 (ISI 2012) were selected for the manual review: The Journal of Operations Management, International Journal of Logistics Management, International Journal of Physical Distribution and Logistics Management, Journal of Business Logistics, Journal of Supply Chain Management, Production Planning and Control, Production and Operations Management, and International Journal of Production Economics. The Journal of Business Forecasting had a strong S&OP orientation, according to the database searches, and it was also reviewed manually to capture S&OP-related articles that did not match the database search terms. Finally, previous literature reviews, particularly the article by Thomé et al. (2012b), were used to identify additional articles falling outside the database searches. It was decided that the period for the manual review would start from 2001, because the original database search, which was not limited to any time period, did not yield any papers with a publication year prior to 2001.

2.1.3. Study selection

Study selection, the third step, requires transparency and a set of explicit selection criteria to assess the relevancy of each study (Denyer and Tranfield, 2009). The following exclusion criteria were applied when reading the article titles, abstracts, and full papers if needed:

(1) Duplicate papers.
(2) Not full papers: This criterion applies to practitioner papers. On the basis of this criterion, the following types of papers were excluded: letters from the editors; S&OP software advertisements; and career interviews.
(3) Papers that did not treat the S&OP concept as an integrated business process OR did not study the S&OP process as a part of an integrated business process. On the basis of this criterion, the following types of papers were excluded: papers covering only sales forecasting and without a link to the S&OP concept; papers covering only production planning and without a link to the S&OP concept; and papers covering only collaborative planning activities with external partners and without a link to the S&OP concept.

The database search identified 246 papers (see Fig. 1). A full bibliography list is available from the authors upon request. First, duplicate papers were excluded on the basis of the titles of the articles, yielding nine excluded papers. The second exclusion criterion, not full papers, resulted in 19 further excluded papers. The third exclusion criterion resulted in 135 articles being excluded for not treating the S&OP process as an integrated business process. Out of the original 246 papers, 83 papers remained after the three exclusion criteria had been applied.

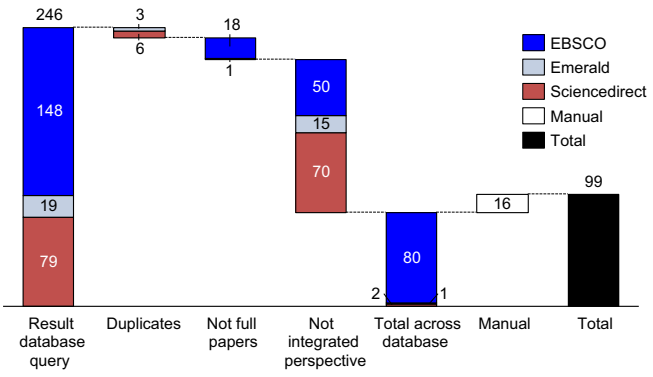

Fig. 1. Results of the literature search.

The high proportion of excluded papers reflects the previous S&OP literature review by Thomé et al. (2012b). The manual review of journals provided 16 new papers, so the total yield for the literature analysis was 99 papers.

2.1.4. Analysis and synthesis

Analysis and synthesis, the fourth step, consists of breaking down individual studies into their constituent parts and describing how each relates to the other (Denyer and Tranfield, 2009). The analysis and synthesis that was conducted is presented in Fig. 2.

In the first part of the analysis, the articles were categorized. They were first categorized into two main categories: (i) academic articles that were published in peer-reviewed periodicals AND had explicit descriptions of the research methods, research materials, and results, (ii) practitioner articles that had no or limited descriptions of the research methods, research materials, or results. Two academic articles that did not meet both of academic category criteria were assigned to the practitioner category (McCormack and Lockamy III, 2005; Adamczak et al., 2013). All the articles were further categorized according to the year of publication and the journal in which they were published. The academic articles were additionally categorized by the main research method. The results of this analysis are summarized in Section 3.1.

Next, two separate content analyses were conducted. Both these analyses aimed to produce answers to Research question 1, how cross-functional coordination is treated in the S&OP literature. First, all 99 articles, including both academic and practitioner articles, were analyzed by applying the conceptual framework of coordination mechanisms, the development of which is described in Section 2.3. The coordination mechanisms dealt with in each article were identified using the conceptual framework and the results were recorded in a database. The results of this analysis are presented in Section 3.2.

Second, a concept-centric analysis (Webster and Watson, 2002) was conducted to identify the thematic content of the academic articles, in order to produce answers in greater depth. This analysis was directed only to academic articles so as to select research articles where the argumentation can be followed by the methodology used. Even though many of the practitioner articles indicated a high level of competence and experience in implementing S&OP processes and practical understanding of the critical success factors, they lack information on how the conclusions were reached and on what evidence they were based, as they had no or limited descriptions of the research methods or research materials. In this analysis, the previously developed conceptual framework (Table 1) was deliberately not used as the basis for the analysis. We wanted to ensure an open-minded approach to the themes of the articles, and to allow differences to emerge between academic S&OP literature and the conceptual framework. In order to identify the coordination mechanisms in the academic articles, the thematic content of each of the academic articles was analyzed separately in depth. Emerging concepts (coordination mechanisms) were identified and recorded. Next, the key concepts uncovered in the individual articles were compared and grouped. The results of this analysis are presented in Section 3.3.

On the basis of the analysis in Sections 3.2 and 3.3, a synthesis of the coordination mechanisms is formed. The synthesis consists of two parts. First, as an answer to Research question 2, an S&OP coordination framework is formed in Section 4.1. Second, research gaps are recognized and areas for further research are identified in Section 4.2, which thus provides answers to Research question 3.

2.1.5. Reporting and using the results

This paper reports the results of this systematic literature review, including the new S&OP coordination framework and proposals for further research, and, thus, is the fifth step in the systematic literature review.

2.2. Increasing the validity and reliability of the research

To increase the validity and reliability of the research, several tactics were adopted. First, the method for conducting a systematic literature review described by Denyer and Tranfield (2009) was closely followed. The conceptual framework was prepared by one researcher and commented upon and refined on the basis of discussions. A sample of papers was reviewed and mapped to the conceptual framework by both of the researchers to ensure similar interpretation of the papers. For the coordination mechanism analysis in Section 3.2, the papers were split between the two researchers and discussed interactively in order to reach high levels of agreement. Identifying the coordination mechanisms in academic articles in Section 3.3 was the responsibility of one researcher, after which the emerging mechanisms were refined with the co-author until a consensus was reached.

2.3. Conceptual framework of coordination mechanisms

In order to analyze how the S&OP literature treats cross-functional coordination, a conceptual framework was developed. The purpose for creating this conceptual framework was to give structure to the analyses in Section 3.2, and to ensure that a wide variety of coordination mechanisms were included. The authors identified the following requirements for the conceptual framework: (i) it should enable systematic, transparent, and replicable analysis to be performed; (ii) it should be applicable not only to the academic literature but also to the practitioner literature with modest descriptions (or a lack of descriptions) of the research

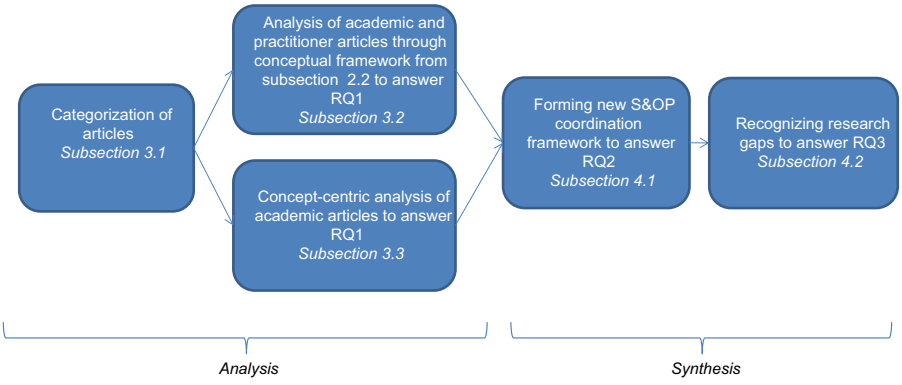

Fig. 2. The process of analysis and synthesis.

Table 1
Conceptual framework of coordination mechanisms derived from Martinez and Jarillo (1989), Thompson (1967), Doz and Prahalad (1981), Romano (2003), Xu et al. (2009) and Barut et al. (2002).

Mechanism	Description
Structure and centralization of decision making	Departmentalization or grouping of organizational units, thus shaping the formal structure (Martinez and Jarillo, 1989). Centralization or decentralization of decision making through the hierarchy of formal authority (Martinez and Jarillo, 1989).
Formalization and standardization	Establishment of routines and rules that constrain action into a path consistent with others in the interdependent relationship (Thompson, 1967). Written policies, rules, job descriptions, and standard procedures such as manuals, charts etc. (Martinez and Jarillo, 1989).
Planning and data management	Systems and processes such as strategic planning, functional plans, scheduling, and goal setting to guide and channel the activities of independent units (Martinez and Jarillo, 1989). Information systems, measurement systems, resource allocation procedures, strategic planning, budgeting process (Doz and Prahalad, 1981).
Output and behavior control	Output control: based on evaluation of files, records, and reports submitted by the units to corporate management. Data includes e.g., financial performance, technical reports, and sales and marketing data (Martinez and Jarillo, 1989). Behavior control: direct supervision (Martinez and Jarillo, 1989).
Lateral or cross-departmental relations (intracompany)	Lateral relations: direct managerial contact across the formal structure (Martinez and Jarillo, 1989). Cross-departmental relations: temporary or permanent teams, task forces, committees, integrators, and integrative departments (Martinez and Jarillo, 1989). Establishing liaison positions linking the operating groups and the standard-formulating centers (Thompson, 1967).
Intercompany relations	Business processes and information system integration at the level of the dyadic interorganizational interface and of the overall supply network (Barut et al., 2002; Romano, 2003; Xu et al., 2009).
Informal communication	Creation of a network of informal and personal contacts among managers, through e.g., management trips, meetings, conferences, transfer of managers (Martinez and Jarillo, 1989).
Socialization	Development of organizational culture through the process of socialization of individuals by communicating to them the way of doing things and the decision making style. Building an organizational culture of known and shared strategic objectives and values by training, transfer of managers, career path management, measurement, and reward systems (Martinez and Jarillo, 1989).

methods and materials; (iii) it should be based on widely agreed results from coordination research; and (iv) it should enable a wide range of coordination mechanisms to be analyzed and not be limited to a narrow set of specific mechanisms.

Martinez and Jarillo's (1989) study was selected as the foundation for the conceptual framework. Martinez and Jarillo (1989) synthesized the work of more than 80 top scholars in the field of coordination in multinational corporations, for example from the works of Thompson (1967), Galbraith (1973), Mintzberg (1979) and Doz and Prahalad (1981).

Malone (1987) defines coordination as a pattern of decision making and communication among a set of actors who perform tasks to achieve common goals. Martinez and Jarillo (1989) define a coordination mechanism as any administrative tool that achieves integration among different units within an organization, further defining mechanisms of coordination and mechanisms of integration as synonyms. On the basis of their exhaustive review, Martinez and Jarillo (1989) divided coordination mechanisms into two main groups: formal and structural mechanisms, and other mechanisms, which are more informal and subtle. According to these authors, the formal and structural mechanisms include departmentalization or the grouping of organizational units, the centralization or decentralization of decision making, formalization and standardization, planning, and output and behavior control. The more informal mechanisms include lateral or cross-departmental relations, informal communication, and socialization.

In addition to the intracompany coordination mechanisms described by Martinez and Jarillo (1989), there is a need to cover the intercompany relationships with respect of the S&OP literature analysis, because S&OP applications can extend beyond company boundaries. This view is related both to dyadic integration and to network integration (Barut et al., 2002; Romano, 2003; Xu et al., 2009). The conceptual framework is also further complemented with Doz and Prahalad's (1981) notes on data management mechanisms, in order to enable an analysis of how data is treated in the S&OP literature as a coordination mechanism. Furthermore, the conceptual framework is complemented with Thompson's (1967) definitions of formalization and standardization, and of cross-departmental relations. The resulting conceptual framework is presented in Table 1.

3. Literature survey and analysis

The results of the analyses are presented in this section. First, the overall categorization of the S&OP literature is presented in Section 3.1. Second, the analysis of the S&OP literature through the conceptual framework is set out in Section 3.2, and third, the concept-centric in-depth analysis of the academic S&OP literature is presented in Section 3.3. These results provide answers to Research question 1: How is cross-functional coordination treated in the sales and operations planning (S&OP) literature?

3.1. Categorization of S&OP literature

The 99 papers identified in the systematic literature review are categorized in this section according to the number of articles (practitioner and academic), journals, year published, and methods and data employed in the empirical articles. As Fig. 3 illustrates, all of the 99 papers were published between 2001 and 2013. The database search did not return any papers with the chosen search terms before the year 2001. This is an interesting finding, considering the evolution of the S&OP process, originating from the 1950s with the birth of aggregated production planning (Singhal and Singhal, 2007). On the evidence of this analysis, it appears that the terms “S&OP” and “sales and operations planning” had settled into use in business and academia by the early 2000s. This result aligns with the previous S&OP literature analysis by Thomé et al. (2012b). The evolution from aggregated production planning to the S&OP process would, apparently, be an interesting topic for further analysis.

As Fig. 3 further illustrates, practitioner literature prevails among the S&OP literature; 75 papers of the 99 were practitioner papers and only 24 were academic. The scarcity of academic

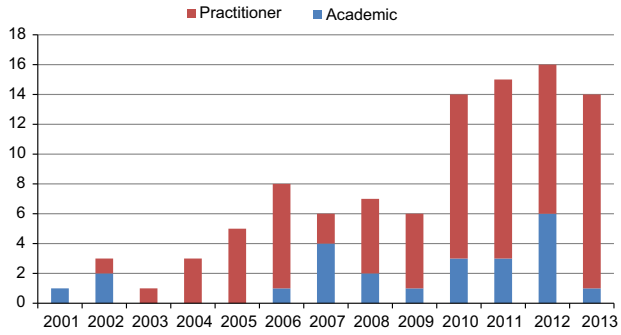

Fig. 3. Analysis of papers according to the year of publication and the type of paper (academic/practitioner) ($N=99$).

research on S&OP has been noted previously (Grimson and Pyke, 2007; Thomas et al., 2011; Thomé et al., 2012a, 2012b). Recently, the academic interest in S&OP appears to be increasing, to judge from the increasing number of academic papers in recent years. This increasing trend is visible in both the academic and practitioner S&OP literature, as for both types of papers, over 50% of the papers included in the literature review were published during the years 2010–2013.

The analysis of papers by journal is presented in Table 2. This analysis shows that although the papers were published in 26 different publications, they are still strongly concentrated in a few journals. The clear majority of practitioner papers (85%) are published in three journals: the Journal of Business Forecasting, Supply Chain Management Review, and Foresight: The International Journal of Applied Forecasting. These three journals have had on-going article series on S&OP with various authors from consultancy, business, and academia. The academic S&OP articles are somewhat more spread across different journals, as six journals account for 70% of the S&OP publications.

The academic papers were further analyzed on the basis of the main methodology applied and the number of citations (Table 3). Modeling was the most common research approach, being applied in eight papers. Additionally, two papers used simulation as the main method, so modeling and simulation together accounted for a total of 41% of the papers. Empirical methods were a slightly smaller category (29% of the papers), consisting of four surveys and three case studies, which are further analyzed in Table 4. The remaining papers consisted of four conceptual models and three literature reviews. Two of the literature reviews (Thomé et al., 2012a, 2012b) applied a similar systematic literature review approach to this study, reporting each step in a structured and transparent manner, while the third was descriptive and discussed the evolution of the planning process.

3.1.1. *Empirical research on S&OP*

Empirical research was chosen as a special interest in this literature analysis, as several authors have emphasized the need for empirical research to complement modeling and simulation studies (Grimson and Pyke, 2007; Nakano, 2009; Syntetos and Boylan, 2011; Thomé et al., 2012a, 2012b). Here we categorize the articles according to the methods and data used (Table 4), and in the following identify the main findings in these seven articles.

The study includes four surveys. Nakano (2009) indicated that sharing resources, collaborative process operation, and collaborative process improvement can affect internal collaborative forecasting, leading to superior logistics and production performance. O'Leary-Kelly and Flores (2002) studied the level of integration in the key decision areas between sales/marketing and production, proposing that an increased level of integration would lead to improved firm performance. Hadaya and Cassivi (2007) demonstrated, on the basis of a survey among one supply network, that collaborative planning has an impact on the strength of relationships and that the use of interorganizational information systems enhances the impact of collaborative planning and strength of relationships on firm flexibility. Olhager and Selldin (2007) investigated the interrelationships between the choice of manufacturing planning and control systems (MPC) and market requirements and operational performance. Their results indicate that the choice of the MPC approach in S&OP has an effect on operational performance, especially in a market characterized by market uncertainty.

The analysis includes three case study articles. Each presents a single case study from a specific perspective. Ivert and Jonsson (2010) explored the potential benefits achieved from using advanced planning and scheduling systems (APS) in the S&OP process. They found benefits concerning decision support, planning efficiency, and learning effects. Collin and Lorenzin (2006) studied how collaborative planning can increase agility in supply chains. Their study is descriptive in nature, discussing the lessons learnt from collaborative planning. They argue that suppliers should use customers' demand plans more effectively in building agility and aligning their supply chains, and that collaborative information technology (IT) applications bring formalization to the planning process. Oliva and Watson (2011) investigated cross-functional alignment in the S&OP process, adopting a process perspective and found that integration was achieved despite functional incentives that did not support integration. They identified information quality, procedural quality, and alignment as the key attributes that drive improved planning performance in

Table 2
Number of papers by journal ($N=99$).

	Number of publications
Academic	**24**
International Journal of Production Economics	5
Journal of Operations Management	3
International Journal of Production Research	3
Industrial Management and Data Systems	2
Journal of the Operational Research Society	2
International Journal of Physical Distribution & Logistics Management	2
The International Journal of Logistics Management	1
Production Planning and Control	1
International Journal of Computer Integrated Manufacturing	1
European Journal of Operational Research	1
Production and Operations Management	1
International Journal of Productivity and Performance Management	1
Journal of Engineering and Technology Management	1
Practitioner	**75**
Journal of Business Forecasting	42
Foresight: The International Journal of Applied Forecasting	13
Supply Chain Management Review	9
Manufacturing Engineer	2
Strategic finance	1
Operations Management	1
Management Services	1
Supply & Demand Chain Executive	1
Supply Chain Forum: International Journal	1
MHD Supply Chain Solution	1
Industrial Engineer	1
Proceedings of the 4th Global Conference on Business and Economics	1
LogForum	1
Grand total	**99**

Table 3
Analysis of academic papers based on main research method and number of citations ($N=24$).

Author(s)	Year of publication	Journal	Main research method	Number of citations (Google Scholar 20.02.2014)
Olhager, J., Rudberg, M. and Wikner, J.	2001	International Journal of Production Economics	Conceptual model	133
O'Leary-Kelly, S.W. and Flores, B.E.	2002	Journal of Operations Management	Survey	192
Olhager, J. and Rudberg, M.	2002	International Journal of Production Research	Conceptual model	43
Collin, J. and Lorenzin, D.	2006	International Journal of Physical Distribution & Logistics Management	Case study	46
Grimson, J.A. and Pyke, D.F.	2007	The International Journal of Logistics Management	Case study	39
Hadaya, P. and Cassivi, L.	2007	Industrial Management and Data Systems	Survey	46
Olhager, J. and Selldin, E.	2007	International Journal of Production Research	Survey	18
Singhal, J. and Singhal, K.	2007	Journal of Operations Management	Literature review	37
Affonso, R., Marcotte, F. and Grabot, B.	2008	Production Planning and Control	Simulation	15
Feng, Y., D'Amours, S. and Beauregard, R.	2008	International Journal of Production Economics	Modeling	33
Nakano, M.	2009	International Journal of Physical Distribution & Logistics Management	Survey	27
Chen-Ritzo, C., Ervolina, T., Harrison, T.P. and Gupta, B.	2010	European Journal of Operational Research	Modeling	6
Feng, Y., D'Amours, S. and Beauregard, R.	2010	International Journal of Production Research	Simulation	7
Ivert, L.K. and Jonsson, P.	2010	Industrial Management and Data Systems	Case study	26
Hahn, G.J. and Kuhn, H.	2011	Journal of Operational Research Society	Modeling	19
Oliva, R. and Watson, N.	2011	Journal of Operations Management	Case study	29
Sodhi, M.S. and Tang, C.S.	2011	Journal of the Operational Research Society	Modeling	5
Hahn, G.J. and Kuhn, H.	2012a	International Journal of Production Economics	Modeling	31
Hahn, G.J. and Kuhn, H.	2012b	International Journal of Production Economics	Modeling	4
Olhager, J. and Johansson, P.	2012	Journal of Engineering and Technology Management	Conceptual model	4
Thomé, A.M., Scavarda, L.F., Fernandez, N.S. and Scavarda, A.J.	2012a	International Journal of Productivity and Performance Management	Literature review	5
Thomé, A.M., Scavarda, L.F., Fernandez, N.S. and Scavarda, A.J.	2012b	International Journal of Production Economics	Literature review	9
Wang, J., Hsieh, S. and Hsu, P.	2012	International Journal of Computer Integrated Manufacturing	Modeling	2
Feng, Y., Martel, A., D'Amours, S. and Beauregard, R.	2013	Production and Operations Management	Modeling	0

Table 4
Papers applying empirical data (surveys and case studies) ($N=7$).

Author(s)	Year of publication	Title of article/chapter	Methodology	Empirical environment
O'Leary-Kelly, S.W. and Flores, B.E.	2002	The integration of manufacturing and marketing/sales decisions: impact on organizational performance	Survey	121 Companies in various manufacturing industries, 3 respondents per company
Collin, J. and Lorenzin, D.	2006	Plan for supply chain agility at Nokia	Case study	1 Company in communications networks industry
Hadaya, P. and Cassivi, L.	2007	The role of joint collaboration planning actions in a demand-driven supply chain	Survey	53 Suppliers in a single supply network in the telecommunications industry
Olhager, J. and Selldin, N.E.	2007	Manufacturing planning and control approaches: market alignment and performance	Survey	128 Companies in various manufacturing industries, 1 respondent per company
Nakano, M.	2009	Collaborative forecasting and planning in supply chains. The impact on performance in Japanese manufacturers	Survey	65 Companies in various manufacturing industries, 1 respondent per company
Ivert, L.K. and Jonsson, P.	2010	The potential benefits of advanced planning and scheduling systems in sales and operations planning	Case study	Chemical industry, 1 company
Oliva, R. and Watson, N.	2011	Cross-functional alignment in supply chain planning: a case study of sales and operations planning	Case study	Consumer electronics manufacturing, 1 company

S&OP. On the basis of their findings, they argue that alignment in the execution of the plans can be more important than the quality of the information and procedure. Furthermore, they identified a further social element, constructive engagement, within the S&OP process: participants were engaged in the process through confrontation and validation of the forecast and the resulting plan.

3.2. Analysis of coordination mechanisms in S&OP literature using the conceptual framework

The 99 papers identified in the systematic literature review are analyzed in this section. As described in Section 2, the analysis was performed using the conceptual framework presented in Table 1.

Fig. 4 summarizes the coordination mechanism analysis, presented in terms of percentages of articles, in order to enable comparisons to be made between the academic and practitioner articles. As Fig. 4 illustrates, the different types of literature had many similarities: both types had a particularly high focus on coordination issues in the planning and data management category (96% of the academic papers, 88% of the practitioner papers), the output and behavior control category (71% and 52%), and the intracompany relations category (54% and 63%). Both the academic and practitioner literature also had a very similar, but relatively low, percentage of papers discussing intercompany relations (25% and 23%). Neither type of literature dealt largely with structure and decision making centralization issues (17% and 11%), while informal communication issues were almost completely absent

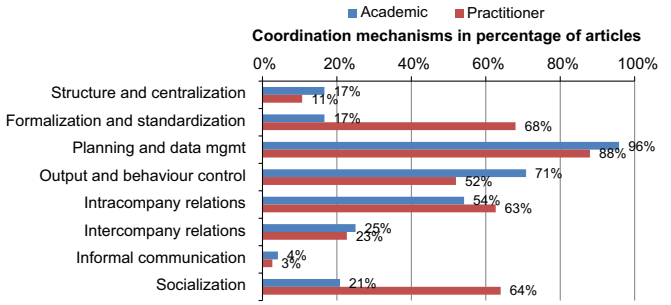

Fig. 4. Coordination mechanisms in academic and practitioner articles (academic articles $N=24$, practitioner articles $N=75$).

(4% and 3%). However, there were two coordination categories, which showed major differences between the types of literature: the formalization and standardization, and socialization categories received much greater emphasis in the practitioner literature: 68% of the practitioner articles dealt with the formalization and standardization category, while only 17% of the academic articles did so. Socialization topics also occurred in the practitioner articles with a frequency three times higher than that in the academic literature (64% versus 21%).

Next, a detailed review of how coordination mechanisms are treated in the literature is presented. A detailed summary of the themes in the articles that were studied is presented in Appendix A.

3.2.1. Structure and centralization of decision making

The first mechanism of the conceptual framework, the structure and centralization of decision making, is mainly treated in the academic articles as a choice between centralized, partially centralized, and decentralized decision making in the S&OP configuration (Affonso et al., 2008; Feng et al., 2008, 2010). There is a clear difference from the practitioner approach, which discusses the topic from a more practical point of view; considering how S&OP should be configured in a global context and proposing alternatives based on organizational design (Boyer, 2011; Milliken, 2011; Nearnberg, 2011; Schubert, 2011). The efficiency of a central planning organization for combining demand and supply plans was studied by Ivert and Jonsson (2010), who found that a central planning organization produced benefits in the form of, for example, creating what-if scenarios and analyzing future events.

3.2.2. Formalization and standardization

The second mechanism, formalization and standardization, is considered in 68% of the practitioner articles (e.g., Baumann, 2010; Bower, 2005; Kelleher, 2012; Lapide, 2005a; McLeod, 2012), which discuss the need for a formal S&OP process and meetings and schedules. This heavy emphasis in the practitioner articles may indicate that adopting standard and formal ways to approach a complex task and create a company-wide plan is challenging for companies. Suggested ways to implement this include accurate planning timetables and decision making points for each planning period (Kelleher, 2012), standard meeting agendas, an S&OP manual (Bower, 2012; Boyer, 2009; Schubert, 2011), training, S&OP certificates, and an internal S&OP community (McLeod, 2012; Mellen et al., 2010; Milliken, 2008).

3.2.3. Planning and data management

The third mechanism in the conceptual framework, planning and data management, is treated widely and from various viewpoints (96% of academic articles, 88% of practitioner articles). The first focus is on the use and quality of the input data. It is emphasized that the data format, a correct data hierarchy, real-time data, and the accuracy, quality, and availability of data are essential for successful S&OP (Grimson and Pyke, 2007; Ivert and Jonsson, 2010; Warren, 2012). If the data quality is not satisfactory, data cleansing or aggregation is needed before it can be used in the planning process (Kelleher, 2012). The selection of a correct planning unit, planning parameters, and time horizon is needed (Boyer, 2009; Harrison, 2009).

Second, the importance of adopting the correct IT tools, such as the IT platform, enterprise resource planning (ERP) system, or portals, or incorporating advanced planning into S&OP is discussed in multiple articles (Affonso et al., 2008; Grimson and Pyke, 2007; Ivert and Jonsson, 2010). Third, the various sub-plans, and their roles in the integrated sales and operations plan, often called "one set of numbers", are dealt within the literature. Many authors discuss scenario planning, simulation, and risk planning as a means to manage uncertainty (e.g., Galluci, 2008; Ivert and Jonsson, 2010; Muzumdar and Wiswanathan, 2009; Tohamy, 2008).

Two aspects of planning, demand planning and the importance of forecast accuracy, are particularly emphasized in the literature (Baumann and Andraski, 2010; Ivert and Jonsson, 2010; Nakano, 2009; Oliva and Watson, 2011). Incorporating demand plans into the supply plan is considered in the form of an aggregated production plan, rough-cut supply plan, and production requirements (Chen-Ritzo et al., 2010; Singhal and Singhal, 2007).

3.2.4. Output and behavior control

The fourth mechanism, output and behavior control, appears to be an important mechanism to enhance integration, to judge from the large number of both academic (71%) and practitioner (52%) articles touching on these issues. Key performance indicators (KPIs) to measure S&OP performance are widely considered in both the academic and practitioner approaches (e.g., Affonso et al., 2008; Collin and Lorenzin, 2006; Muzumdar and Fontanella, 2006). The practitioner literature further discusses the S&OP process audits and joint process development (e.g., Bower, 2005; Boyer, 2009; Halim, 2011; Muzumdar and Fontanella, 2006). Muzumdar and Wiswanathan (2009) and Tohamy (2008) propose benchmarking against the best performers in the industry.

Some practitioner articles propose that the S&OP process can act as a powerful tool for increasing sales and enhancing meeting business growth (Alexander, 2013; Chase, 2013; McCall, 2013). In this approach, S&OP actively pursues growth, by identifying gaps between growth targets and the S&OP plan, and by seeking to create new value for customers and shareholders through new products, services, customers, markets, and business models to fulfill the gaps (Alexander, 2013). This approach changes the perspective of S&OP from inward focused to outward focused (Chase, 2013).

3.2.5. Intraorganizational relations

The fifth mechanism, intraorganizational relations, creates cooperation and collaboration across functions. All in all, collaboration across functions is widely discussed in both the practitioner and academic literature (54% of the academic and 63% of the practitioner articles). The authors generally agree that a cross-functional S&OP organization with a process owner and sponsor, supported by top management, is a prerequisite for succeeding in S&OP (Grimson and Pyke, 2007; Nakano, 2009; O'Leary-Kelly and Flores, 2002). The organization design needs to be aligned to the needs of a global S&OP process and organization. Even so, some authors find that few firms have reached the level of integration required to achieve company-wide integrated planning and have

implemented those plans (O'Leary-Kelly and Flores, 2002; Oliva and Watson, 2011).

3.2.6. Interorganizational relations

The sixth mechanism, interorganizational relations, creates cooperation and collaboration across companies. Interorganizational relations are mostly considered through collaborative supply chain planning concepts, for example Collaborative Planning, Forecasting, and Replenishment (CPFR), Vendor-Managed Inventory (VMI), or through IT integration tools such as portals or the Internet (Baumann and Andraski, 2010; Nakano, 2009; Smith et al., 2010). Hadaya and Cassivi (2007) and Smith et al. (2010) further propose adopting a collaboration or partnership strategy.

Thomé et al. (2012b) propose that firm performance improves through S&OP particularly when interorganizational information systems favor supply chain integration. Nakano (2009) does not find a clear connection between external forecasting and logistics performance in his survey- and model-based study.

3.2.7. Informal communication

The seventh mechanism from the conceptual framework, informal communication, is almost totally absent in the S&OP literature. This indicates that S&OP is understood as a formal process, with pre-specified practices and the meeting of agendas. Only two articles express the importance of informal communication between individuals, teams, and functions (McCormack and Lockamy III, 2005; Mello, 2010). In addition, Oliva and Watson (2011) also discuss horizontal and informal mechanisms.

3.2.8. Socialization

The eighth mechanism, socialization, is connected to creating a common culture in the company and creating career paths and training systems for individual workers. Socialization topics appear with much higher frequency in the practitioner articles than in the academic literature: 64% of the practitioner articles deal with socialization, while only 21% of the academic articles do so. To judge from this high frequency, socialization appears to be an important topic for companies, for example, creating a common culture and common business assumptions (Bower, 2005; Boyer, 2009; Oliva and Watson, 2011) and the empowerment and motivation of employees, as well as aligning S&OP to business targets and strategy (e.g., Bower, 2012; Boyer, 2011; Grimson and Pyke, 2007; Oliva and Watson, 2011).

Corporate culture and norms, top management setting an example, commitment, trust, and loyalty are discussed in many of the S&OP articles in terms of critical success factors for S&OP (e.g., Harwell, 2006; Mellen et al., 2010; Stahl, 2010; Stahl and Levine, 2011; Stahl and Mansfield, 2010). Many recent articles deal with the question of how the company succeeds in adopting a collaborative manner of working (Bower, 2005; Harrison, 2009; Oliva and Watson, 2011). The capability to strive for consensus in creating a common plan is an important factor in a successful S&OP process (Stahl, 2010). Mello (2010) describes S&OP as a highly social process, involving cooperative efforts among individuals, functions, and other companies and requiring communication, sharing data, striving for consensus, and achieving common objectives. Particularly important aspects are dealing with conflicts and creating the rules for escalated decision making (Oliva and Watson, 2011; Stahl, 2010; Stahl and Levine, 2011).

3.3. Concept-centric analysis of academic S&OP literature

The contents of the academic S&OP research papers are analyzed using the concept-centric approach (Webster and Watson, 2002). This analysis includes all of the 24 academic articles identified in this study. The process followed the one suggested by Webster and Watson (2002). First, the key concepts of each article were identified and recorded into a database. The concepts were required to be the main focus of each article; concepts only briefly mentioned in an article were ignored. After that the key concepts were collected to logical groups. As a result, from the emerged key concepts, the following six coordination mechanisms were condensed: S&OP organization; S&OP process; S&OP tools and data; performance management; strategic alignment; and S&OP culture and leadership. In this section the contents of the articles are analyzed in the light of these mechanisms, and summarized in Table 5.

3.3.1. S&OP organization

Three main perspectives on organizational structure were identified in the articles that were examined. Surprisingly, the perspective seems to differ according to the research methodology used.

First, the S&OP organization is discussed through the *supply chain structure*, referring to four main supply chain stages: procurement; production; distribution and sales. This perspective to S&OP organization prevails in the modeling and simulation articles (Affonso et al., 2008; Chen-Ritzo et al., 2010; Feng et al., 2008, 2010; Hahn and Kuhn, 2011, 2012a, 2012b; Wang et al., 2012). Traditionally these supply chain stages have been managed independently, each stage making decisions without interaction to other stages. Feng et al. (2008) argue that decentralized decision making decreases the complexity of the decision making, but it simultaneously limits the potential of cost reduction and profitability, and therefore companies are moving to more coordinated and integrated planning and control of their supply chain. Affonso et al. (2008) and Feng et al. (2008, 2010) studied the centralization of decision making as a choice between centralized, partially centralized, and decentralized decision making in the S&OP configuration. The level of integration is a key component in a company's S&OP configuration: depending on the business context, there can be global and local S&OP meetings, and some topics are not part of S&OP at all, as they are decided completely locally.

Second, in the survey-based articles in this literature research, the S&OP organization is studied through *the level of integration* between different functions participating in the S&OP process. The level of integration refers to the types and degree of collaboration and participation that exist between the different functions. Nakano (2009) studied the degree of sharing resources, collaborative process operation, and collaborative process improvement in the S&OP process; O'Leary-Kelly and Flores (2002) focus on the level of integration in the key decision areas between marketing/sales and manufacturing, and Hadaya and Cassivi (2007) study the level of joint collaboration in planning actions and the strength of relationships.

Third, in the case articles, the S&OP organization is studied through *roles and responsibilities*. Grimson and Pyke (2007), Ivert and Jonsson (2010), Collin and Lorenzin (2006) and Oliva and Watson (2011) describe the roles and responsibilities of the participants in the S&OP and the interaction between them: each function has specific tasks and activities, which they are responsible to carry according to predefined schedules aligned with the common S&OP calendar. S&OP also includes shared activities, whereby the different functions together validate the plans and assumptions in the S&OP meetings to produce the consensus forecast. Oliva and Watson (2011) indicate that the active involvement by all the participants increases the commitment and compliance to the consensus forecast, referring to it as constructive engagement. Grimson and Pyke (2007) also highlight the importance of executive participation.

Table 5
The coordination mechanisms and main constructs of each academic article in the concept centric analysis ($N=24$).

Author(s)	Year of publication	S&OP organization	S&OP process	S&OP tools and data	Performance management	Strategic alignment	S&OP culture and leadership
Olhager, J., Rudberg, M. and Wikner, J.	2001					Production/ capacity strategy	
O'Leary-Kelly, S.W. and Flores, B.E.	2002	Level of integration	Dynamic collaborative		Financial		
Olhager, J. and Rudberg, M.	2002					Production/ capacity strategy	
Collin, J. and Lorenzin, D.	2006	Roles	Dynamic collaborative	Enabler	Financial, operations		
Grimson, J.A. and Pyke, D.F.	2007	Roles	Dynamic collaborative		Financial, operations, process		Aligned objectives, top management ownership, collaborative manner
Hadaya, P. and Cassivi, L.	2007	Level of integration	Dynamic collaborative	Enabler, S&OP specific data requirements			Aligned objectives, collaborative manner
Olhager, J. and Selldin, E.	2007				Operations	Business strategy	
Singhal, J. and Singhal, K.	2007			Enabler	Financial, operations		
Affonso, R., Marcotte, F. and Grabot, B.	2008	Structure	Method-oriented	Enabler	Financial		
Feng, Y., D'Amours, S. and Beauregard, R.	2008	Structure	Method-oriented		Financial		
Nakano, M.	2009	Level of integration	Dynamic collaborative		Financial, operations		
Chen-Ritzo, C., Ervolina T., Harrison, T.P. and Gupta, B.	2010	Structure	Method-oriented		Financial		
Feng, Y., D'Amours, S. and Beauregard, R.	2010	Structure	Method-oriented		Financial		
Ivert, L.K. and Jonsson, P.	2010	Roles	Dynamic collaborative	Enabler, S&OP specific data requirements	Process		Aligned objectives
Hahn, G.J. and Kuhn, H.	2011	Structure	Method-oriented		Financial		
Oliva, R. and Watson, N.	2011	Roles, constructive engagement	Dynamic collaborative	Enabler, S&OP specific data requirements	Financial, operations, process		Aligned objectives, rewarding and incentives, top management ownership, collaborative manner, empowerment
Sodhi, M.S. and Tang, C.S.	2011				Operations		
Hahn, G.J. and Kuhn, H.	2012a	Structure	Method-oriented		Financial	Production/ capacity strategy	
Hahn, G.J. and Kuhn, H.	2012b	Structure	Method-oriented		Financial	Production/ capacity strategy	
Olhager, J. and Johansson, P.	2012					Production/ capacity strategy	
Thomé, A.M., Scavarda, L.F., Fernandez, N. S. and Scavarda, A.J.	2012a				Financial, operations, process		Aligned objectives
Thomé, A.M., Scavarda, L.F., Fernandez, N. S. and Scavarda, A.J.	2012b				Financial, operations, process	Business strategy	Aligned objectives, collaborative manner, empowerment
Wang, J., Hsieh, S. and Hsu, P.	2012	Structure	Method-oriented		Financial		
Feng, Y., Martel, A., D'Amours, S. and Beauregard, R.	2013				Financial		

3.3.2. S&OP process

Two different perspectives on the S&OP process were recognized in the literature.

On the one hand, the S&OP process is understood as a *dynamic collaborative planning and decision making process between functions*. Grimson and Pyke (2007) present an S&OP process maturity model: in the initial stages the S&OP process is reactive, with a silo culture and without formal planning, collaboration, and meetings. When moving towards advanced and proactive planning, the S&OP process becomes more formalized and integrated, with both internal and external collaborations, aiming at seamlessly integrated plans and optimized profit for the company. Nakano (2009) discusses the S&OP process as a collaborative forecasting and planning process consisting of downstream collaboration, interdepartmental collaboration, and upstream collaboration. Other aspects are key decision making areas in manufacturing and marketing/sales planning, developing long-range demand forecasts, sales plans, and promotion plans, and determining long-term capacity requirements and production plans (O'Leary-Kelly and Flores, 2002), collaborative demand and supply planning, where consensus forecasts, delivery plans, and production plans are prepared (Ivert and Jonsson, 2010), and studying the S&OP process through cross-functional meetings, where plans and business assumptions are assessed and decided upon (Oliva and Watson, 2011). When the S&OP process is treated as a planning and decision making process between functions, the authors emphasize the underlying elements of constructive engagement and the pursuit of cross-functional alignment.

On the other hand, others apply a *method-oriented perspective on planning*, using a structured approach for fact-based decision support aiming to minimize costs or maximize profits with a defined set of constraints (Affonso et al., 2008; Chen-Ritzo et al., 2010; Feng et al., 2008, 2010; Hahn and Kuhn, 2011, 2012a, 2012b; Wang et al., 2012). Modeling and simulation-based studies have provided valuable insights about the effects of S&OP on company performance by investigating e.g., the conflicting functional goals of procurement, production, distribution, and sales planning (Wang et al., 2012), or the integration between various sub-plans – the sales plan, operations plan, and supply plan (Affonso et al., 2008).

3.3.3. S&OP tools and data

Two perspectives on S&OP tools and data were recognized in the academic S&OP literature: first, the literature discusses *IT systems as key enablers*, and second, the literature brings up the *S&OP specific data requirements*.

Grimson and Pyke (2007) argue that enabling technology might be required for S&OP, but that especially in the early stages of S&OP implementation it is more important to have a well-understood business process than an elegant IT tool. Simple spreadsheets can be used in the pilot phase, so that the focus is on establishing the proper process. According to their maturity model, when moving towards advanced and proactive S&OP stages, IT solutions become more important. This means adopting specific S&OP tools and optimization tools for sharing information whereby the whole S&OP organization has access. This view is supported by Ivert and Jonsson (2010), who argue in their case study that the S&OP process can be difficult to handle without software system support and this makes companies require more advanced planning features in their S&OP system. The authors propose improved decision support, planning efficiency, and learning effects as being potential benefits from advanced planning systems for the S&OP process. Collin and Lorenzin (2006) also emphasize the need for an integrated IT platform in order to provide information transparency and a common control room for all stakeholders. Hadaya and Cassivi (2007) indicate that inter-organizational information systems have positive effects on firm flexibility.

In the academic S&OP articles, S&OP specific data requirements are approached by Grimson and Pyke (2007), Ivert and Jonsson (2010), and Oliva and Watson (2011). According to Grimson and Pyke, in the early stages of S&OP, the data is separately owned and updated without any consolidation; in the standard level of S&OP, data is shared and consolidated but not in an efficient and automated way; and the advanced and proactive S&OP stages include integrated real-time data and external data from suppliers and customers. Ivert and Jonsson (2010) emphasize that S&OP planning data needs to be updated and accurate, referring especially to the quality of the demand plan and to the need to trust the plan: if the data is not updated, the users lose confidence and this becomes a vicious cycle. Oliva and Watson (2011) argue that the information used for the decision making needs to be appropriate both in content and in form, requiring common validation and interpretation of the data. It is interesting to note that the practitioner literature discusses the data requirements to a much greater extent than the academic literature.

3.3.4. Performance management

Three perspectives on performance management were identified in the S&OP articles: *financial performance*, *operations performance*, and *process performance*.

Financial performance includes logistics and manufacturing costs (Nakano, 2009), optimizing profits, revenue, costs or Economic Value Added (Affonso et al., 2008; Chen-Ritzo et al., 2010; Feng et al., 2008, 2010; Hahn and Kuhn, 2011, 2012a, 2012b; Wang et al., 2012). In their survey O'Leary-Kelly and Flores (2002) measured the profitability as perceived by the respondents. The perspective of operations performance was researched by Nakano (2009) and included order fill rate, delivery speed, and delivery time measures, by Olhager and Selldin (2007) with quality, delivery speed, delivery reliability, volume flexibility, and product mix flexibility measures, by Oliva and Watson (2011) with forecast accuracy, inventory, on-time delivery, and obsolescence measures, and by Sodhi and Tang (2011) with delivery capability and inventory measures. The perspective of process performance was handled by Ivert and Jonsson (2010) with proposed improvements to decision support, planning efficiency, and learning effects, and by Grimson and Pyke (2007). The practitioner S&OP literature discusses S&OP process audits and continuous improvement efforts to a much greater extent.

When comparing the current literature study to a previous literature review on performance measurement in S&OP (Thomé et al., 2012a), some similarities and differences were recognized. In both studies a lack of a unifying framework for the performance measurement for S&OP and the related constructs was identified. Both studies also identified the need for measures to deal with the conflicting functional interests inherent in S&OP decision making. The articles in this study's sample, particularly those from the recent years, treat the trade-off or end result measures as follows: trade-off between customer service and inventory levels (Sodhi and Tang, 2011), trade-off between flexibility and supply chain costs (Affonso et al., 2008), maximization of company profit or Economic Value Added (EVA) (Chen-Ritzo et al., 2010; Feng et al., 2008, 2010; Hahn and Kuhn, 2011, 2012a, 2012b; Wang et al., 2012). This finding deviates from the conclusion by Thomé et al. (2012a), according to which S&OP results were usually measured based on achieved alignment and integration or from a single outcome perspective.

Many S&OP articles emphasize the full supply chain view of S&OP. For example Collin and Lorenzin (2006) discuss the importance of sharing performance metrics with supply chain

partners, thereby aiming to ensure a high service level, short leadtimes, improved asset efficiency and reduced non-quality costs. Many practitioner articles emphasize the importance of multi-perspective measurement in S&OP (Chase, 2013; Iyengar and Gupta, 2013; Milliken, 2008; Muzumdar and Fontanella, 2006), very similar to the Balanced Scorecard.

3.3.5. Strategic alignment

Strategic alignment refers to the tactical role of S&OP as a vertical link between short-term operational plans and an organization's long-term strategic targets and plans. In the articles, strategic alignment is considered from two perspectives: *alignment with overall business strategy* and *alignment with production strategy*.

Alignment with overall business strategy is treated by Thomé et al. (2012b), who propose a synthesis framework, discussing vertical alignment within S&OP. Their framework positions S&OP vertically between operations and the corporate strategic plan, considering business context, inputs and outcomes of S&OP. Olhager and Selldin (2007) studied the alignment between market requirements in business strategy and S&OP, and found that efficient alignment improves significantly firm performance.

Alignment between S&OP and production strategy is treated in four articles. Olhager et al. (2001) propose a framework for the alignment between capacity strategy and S&OP, pronouncing capacity strategy in terms of capacity levels, and expansion/reduction strategies and S&OP in terms of planning strategies for production relative to sales, inventory, and/or backlogs. Olhager and Johansson (2012) extend the alignment framework to also cover service operations planning. Hahn and Kuhn (2012a, 2012b) also discuss the alignment of capacity strategy in S&OP, covering different strategies for capacity adjustment and investments.

3.3.6. S&OP culture and leadership

S&OP culture and leadership includes an organizational mindset and practices that facilitate and advance formal planning. The following perspectives were identified: *aligned objectives*; *rewarding and incentives*; *top management ownership*; *collaborative manner*; and *empowerment*.

Aligned objectives refer to an organization having common business objectives, which are communicated to the organization and which serve to guide decision making and gap closing in the S&OP process. Depending on planning maturity, the aligned business objectives do not only cover the internal functions but can also include the firm's external partners (Grimson and Pyke, 2007; Hadaya and Cassivi, 2007). Furthermore, Oliva and Watson (2011) discuss rewarding and incentives, stating that S&OP as a collaborative process can enhance integration despite functional incentives that do not support integration.

Top management ownership is discussed at length in the practitioner literature, but in the academic literature is brought up less often. In Grimson and Pyke's (2007) maturity framework, executive participation increases together with the S&OP process maturity. Required collaborative manner is discussed more frequently in academic literature: trust between involved functions and participants, commitment to the plan and striving for consensus (Grimson and Pyke, 2007; Hadaya and Cassivi, 2007; Oliva and Watson, 2011; Thomé et al., 2012b). Empowerment is also seen as a key cultural requirement for S&OP, encouraging employees to participate actively in the S&OP process.

4. Synthesis of S&OP literature review

The syntheses of the literature review are presented in this section. First, the S&OP coordination framework is presented to answer Research question 2: "How can coordination mechanisms be synthesized into a coordination framework in the context of S&OP". Second, recognized research gaps and areas for further research are presented in Section 4.2 in order to answer Research question 3: "Which aspects of coordination in the context of S&OP require more attention in academic research?"

4.1. Forming the S&OP coordination framework

The observations from the S&OP literature are used to synthesize a unified framework, which is called the S&OP coordination mechanism framework (Fig. 5 and Table 6). This section first describes how the S&OP coordination framework was formed based on the previous analysis. Then, the mechanisms are described one by one, and the dependencies between the mechanisms are explained.

The coordination mechanisms in the S&OP coordination framework were selected based on the two separate content analyses: the analysis of both practitioner and academic articles using the conceptual framework (Section 3.2), and the concept-centric analysis of the academic articles (Section 3.3). The first four mechanisms, S&OP organization, S&OP process, S&OP tools and data, and performance management, are mainly derived from the concept-centric analysis from the academic articles, complemented with the findings from the conceptual framework analysis. The mechanisms strategic alignment and S&OP culture and leadership are also derived from the concept-centric analysis, but both are influenced by the findings of the practitioner literature. Three mechanisms, intracompany relations, intercompany relations, and informal communication, from the conceptual framework (Table 1) are included in the S&OP coordination framework as follows: intracompany relations and intercompany relations are essential components of the S&OP process and organization mechanisms; informal communication is embedded within S&OP culture and leadership, but it does not play an important role in the overall S&OP process due to its formal nature.

The first mechanism is the ***S&OP organization***, the purpose of which is to identify the actors and functions involved in S&OP. The S&OP organization defines *the formal structure*, including all of *the relevant organizations*, *organizational units*, *and actors in S&OP*. The essential elements of the formal structure are *the decision making authorities*, *the configuration for centralization/decentralization*, and the descriptions of *roles and responsibilities* and *process activities*.

The second mechanism is the ***S&OP process***, the purpose of which is to define how different sub-plans are created and communicated in S&OP. The S&OP process defines the formal *planning activities*, *decision making processes* and the *collaborative activities* within the S&OP organization. The essence of the S&OP

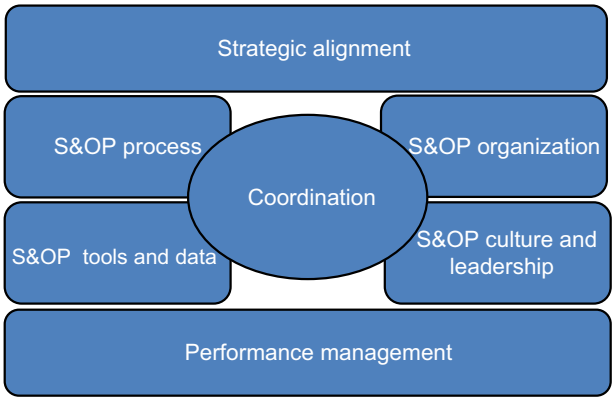

Fig. 5. S&OP coordination framework formed as synthesis of concept analyses.

Table 6
Description of S&OP coordination mechanisms.

S&OP coordination mechanism	Description	Objective	Constructs
S&OP organization	Formal organizational S&OP structure	To define the organizations actors and organizational units involved in S&OP	Decision making authorities, configuration for centralization/decentralization and roles and responsibilities
S&OP process	Formal and standardized process for conducting S&OP	To define how different sub-plans are created and communicated in S&OP	Decision making practices, collaborative planning involving both internal and external actors
S&OP tools and data	Processes and tools for capturing, sharing, storing and refining data needed for S&OP decision making	To provide S&OP with good quality data according to the needs and requirements, and to support S&OP with purposeful IT tools	Input information, methods for processing and storing information, output information and IT tools to support S&OP
Performance management	Measurement and optimization of firm performance	To ensure reaching the set business targets	Practices for managing financial performance, operations performance, and process performance, target setting and follow-up process
Strategic alignment	S&OP role as a link between company strategy and operational planning, and reinforcing the reaching of the company's strategic business targets	To reach the company's strategic goals the role of implementing strategy in operations	Linking company's strategic targets to operational planning and reinforcing the reaching of the company's strategic business targets through creation of new products, services, customers and business models
S&OP culture and leadership	Culture and leadership required to support and enhance S&OP	To create leadership and organizational culture favorable for successful S&OP implementation	The organization's culture, such as commitment, trust, top management setting an example, collaborative manner, empowerment; and practices that facilitate and advance formal planning, such as communication, training and staff development

process is the dynamic collaborative planning and decision making process between functions.

The third mechanism is ***S&OP tools and data***, which aims at providing S&OP with best-quality information and purposeful IT tools to create operational plans. S&OP tools and data include constructs such as *a common set of data* and *common validation and interpretation of data*, which are also essential for effective decision making in the S&OP process. The advanced and proactive S&OP stages include *integrated real-time data* and *external data from suppliers and customers. S&OP data quality requirements* are defined according to the following dimensions: the need to be accurate, updated frequently, and appropriate in terms of both content and form in order to be trusted and useful for the participants in the S&OP process. Next, the methods for *data processing and storage* are defined, which may be manual, but when moving towards advanced and proactive S&OP stages, advanced IT solutions become more essential.

The fourth mechanism is ***performance management***, which defines the methods and activities needed for performance measurement, target setting and support for reaching the desired goals. Performance management consists of *financial performance*, *operations performance*, *and process performance*, and the associated *target setting* and *follow-up process*. Financial performance deals with the measurement and optimization of profits, revenue, costs, or Economic Value Added. As previously stated, business performance optimization requires the S&OP process, data, and IT tools to have achieved advanced stages of maturity. Operational performance includes, for example, order fill rate, on-time deliveries, delivery time, forecast accuracy and quality measures. Process performance includes measuring and auditing the S&OP process, planning efficiency, and learning effects.

The fifth mechanism is ***strategic alignment***, the purpose of which is to act as a vertical link between short-term operational plans and the organization's long-term strategic targets and plans. This mechanism includes the following constructs: *linking company's strategic targets to operational planning* and *reinforcing the reaching of the company's business targets.*

Linking the company's strategic targets to operational planning refers to the two-way feedback link built into the nature of the S&OP process: On the one hand, it focuses on transforming the company's high-level strategic targets in order to concrete tactical and operational targets, activities and plans. On the other hand, S&OP measures provide feedback to the strategy planning process, helping to assess whether things are progressing according to the strategy or whether actions are needed.

The second construct, reinforcing the reaching of the company's business targets, exposes the special role S&OP can take to promote sales. Many companies use S&OP to drive productivity improvements within existing business. However, S&OP can actively pursue sales, by identifying gaps between strategic business targets and the S&OP plan, and by seeking to create new value for customers and shareholders through new products, services, customers, markets, and business models to fulfill the gaps. This approach changes the perspective of S&OP from internal to towards the market by stimulating and shaping demand.

The sixth mechanism is ***S&OP culture and leadership***, which aims at creating an organizational culture favorable for successful S&OP implementation. It includes *the organizational mindset* and *practices that facilitate and advance formal planning*: common aligned business objectives, rewarding and incentives, corporate norms, commitment, trust, top management setting an example, collaborative manner, empowerment, constructive engagement, and competence in dealing with conflicts. The capabilities that are needed are gained through *formal and informal communications*, *training*, and *staff development* in general.

As Fig. 5 illustrates, the mechanisms affect and are dependent on each other. Performance management builds the foundation for all activities. Strategic alignment is the "roof of the house" and emphasizes the importance of vertical coordination. Tools and data support S&OP processes, and are located below it. S&OP culture and leadership support the organization. Cross-functional coordination is at the center and requires processes and organization as complementary elements.

4.2. Identifying areas for further research

Some specific aspects of S&OP deserve attention from the academic community in the form of further research from the viewpoint of coordination. The academic literature identifies several coordination-related challenges connected to S&OP, for example sub-optimal decisions (Feng et al., 2008), difficulties in reaching the desired level of integration (Oliva and Watson, 2011), trading off the risk between unmet demand and excess supply (Sodhi and Tang, 2011), managing uncertainties in demand (Chen-Ritzo et al., 2010), and supporting the supply network and reaching intercompany integration (Affonso et al., 2008; Wang et al., 2012). Three particular areas for further research identified in this study are discussed. The need to address these research areas with empirical studies is also discussed here.

First, we found the need to study a wide variety of coordination mechanisms to create a more comprehensive understanding of *how* S&OP needs to be implemented. This observation originates from the comparison between the academic and practitioner articles. According to the analysis, the implementation challenges of S&OP are dealt with widely in the practitioner literature, but are almost totally absent from the academic articles. The current academic research offers few guidelines for companies on how to benefit most from S&OP, which is somewhat surprising given the high implementation costs and the high level of expected benefits. The study by Grimson and Pyke (2007) contributes to this by presenting an integration framework with five integration stages. A particular issue to be addressed in future research is the impact of the implementation of S&OP on firm performance. Thomé et al. (2012a) previously recognized the need to expand analysis of S&OP impact on firm performance to different business contexts. We propose studying S&OP implementation and firm performance exploiting a wide variety of coordination mechanisms. We also propose further research on how to link S&OP and the Balanced Scorecard, as many practitioner articles raised the need for multi-perspective measurement in S&OP.

Second, we observe that specific coordination mechanisms, particularly strategic alignment and S&OP culture and leadership, deserve more research. This need for further research was discovered through the S&OP coordination framework created in this paper, as well as the differences between the academic and practitioner articles. The practitioner literature focused strongly on corporate culture, leadership topics, and strategic alignment topics. These focus areas indicate they are of special interest to practitioners and should also be further explored in academic research. Oliva and Watson (2011) recognized the role of social elements, such as constructive engagement and the pursuit of alignment, in achieving organizational integration in the context of the S&OP process. Their study should be expanded beyond the scope of a single case study and also cover S&OP culture and leadership and strategic alignment more widely.

Third, we recognize that S&OP can serve as a powerful tool for increasing sales and enhancing meeting the strategic business targets. Our observation from the literature was that S&OP is generally considered as a technical and formal tool to integrate business functions, providing an integrated plan where demand and supply are balanced. However, we see that the role of S&OP can be more powerful: it can be designed as an efficient tool for identifying and closing gaps between the plan and business targets. Practitioners already discuss “Market-driven S&OP” or “Executive S&OP” (see for example Alexander, 2013; Cecere, 2012; Chase, 2013; McCall, 2013), and take a more inside-out perspective towards the market by shaping demand and orchestrating supply and thus go beyond classical demand and supply balancing. Furthermore, modeling approaches have been proposed (e.g., Hahn and Kuhn 2012a, 2012b; Sodhi and Tang, 2011), which explicitly consider marketing activities to shape demand in order to better utilize capacities, but these views are still in their infancy. Conceptual and empirical literature is largely missing and definitely deserves further research with a new type of thinking and process design covering strategic business targets.

Finally, we provide rationales for the need for further empirical studies. For example Syntetos and Boylan (2011) emphasized the need for empirical research in this area to complement the modeling and simulation studies. According to these researchers, S&OP, supply chain planning and forecasting are crucial organizational processes that benefit from a wide variety of methodological approaches. This literature review confirmed the scarcity of empirical research, as it included only eight papers with empirical data. Furthermore, it was an interesting finding that three of the four survey articles (Nakano, 2009; O’Leary-Kelly and Flores, 2002; Hadaya and Cassivi, 2007) recognized the complexity of the S&OP phenomenon being studied and identified limitations in their survey-based articles, such as the measures used and the usage of a self-report approach instead of outside observer (O’Leary-Kelly and Flores, 2002). Hadaya and Cassivi (2007) further identified the problems connected to a small data sample and constructs being operationalized with a limited number of items, which they see as limiting the generalizability and reliability of results. Nakano (2009) proposed using case studies to gain a better understanding of the dynamic nature of process improvement within S&OP. The absence of multiple case studies was also an unexpected finding, as all the three case studies in this analysis reported a single case study. Furthermore, two of the three case studies each focused on a single perspective: utilization of advanced planning tools (Ivert and Jonsson, 2010) and importance of agility (Collin and Lorenzin, 2006). The case study by Oliva and Watson (2011) appeared to be an exception among the empirical papers, investigating S&OP in-depth with a process approach from process, organization, data and behavioral dynamic perspectives.

As a conclusion, we propose case studies with multiple perspectives to deal with the complexity of the S&OP phenomenon. In-depth case studies in best-performing companies would benefit the field by identifying best practices in different contexts.

5. Conclusions

This systematic literature review analyzes and summarizes from a coordination viewpoint the extant literature on S&OP, consisting of 99 full papers. Categorization of the articles revealed an increase in the number of articles during recent years and that practitioner articles dominated the field. This indicates companies' challenges to predict demand changes and align supply accordingly in a cost-efficient manner. The study identifies S&OP to be a complex phenomenon that would benefit from academic research, particularly from in-depth empirical studies.

Based on the synthesis resulting from the literature review, an S&OP coordination framework was proposed. The S&OP coordination framework consists of six coordination mechanisms labeled the S&OP process, S&OP organization, S&OP tools and data, performance management, strategic alignment, and S&OP culture and leadership. For companies, S&OP appears to have two facets: the hard side, consisting of formal procedures, schedules, data, and performance, and the soft side, consisting of a common culture, commitment, trust, and collaboration. This framework emphasizes the tactical role of S&OP between company strategy and operational planning, as well as the importance of creating a specific leadership style and culture in the organization.

The study has both academic and managerial implications. For managers the S&OP coordination framework offers a better understanding of the potential mechanisms that enhance cross-functional planning and decision making. One particular implication

is that there is a variety of mechanisms to be addressed in S&OP. It is not only the process-related and organization-related tools that need to be considered, but what is equally important, or even more important, is to consider and create an S&OP culture and climate in the organization. In addition, the S&OP coordination framework emphasizes the role of S&OP in supporting the connection between operations and business strategy. For academics, this paper synthesizes the current knowledge of coordination mechanisms in the S&OP context, presents a proposal for an S&OP coordination framework, and identifies under-researched areas as proposals for further research.

As with any study, there are limitations in this analysis. The selection of articles was limited to the articles focusing on the specific planning process referred to as sales and operations planning or S&OP. Thus, articles referring to, for example, aggregated production planning, manufacturing resource planning, demand–supply balancing, and integrated business planning were not searched, and nor were conference papers and books, which were excluded from this study. Further, the discussion on the coordination mechanisms in the articles is not explicit, so the analysis includes interpretation of the applicable coordination mechanism categories based on the analysis of the full text. Employing two different and separate methods for analyzing the articles, aimed to gain a fuller understanding of the coordination mechanisms in the S&OP literature. However, the two analyses were not fully isolated from each other and hence the findings in one analysis might have indirectly affected the interpretation in the other. Thus, we propose further research to study the coordination mechanisms in an empirical context.

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Appendix A. Coordination mechanism categories in S&OP literature (academic and practitioner articles, $N=79$)

Mechanism	Authors
Centralization	
Central planning organization for demand and supply; centrally managed process	*Academic:* Ivert and Jonsson (2010) *Practitioner:* Reyman (2005)
Choice between centralized, partially centralized, and decentralized decision making in S&OP configuration	*Academic:* Affonso et al. (2008), Feng et al. (2008, 2010) *Practitioner:* Adamczak et al. (2013)
Configuration for Global S&OP process and organization	*Practitioner:* Boyer (2011), Lapide (2011a), Milliken (2011), Nearnberg (2011), Schubert (2011), Wallace (2011)
Formalization and standardization	
S&OP process and meetings, formality, discipline	*Academic:* Grimson and Pyke (2007), Ivert and Jonsson (2010), Oliva and Watson (2011), Thomé et al. (2012b) *Practitioner:* Adamczak et al. (2013), Baumann (2010), Bower (2005, 2006, 2012), Boyer (2009, 2011), Daviaud (2006), Galluci (2008), Goodfellow (2012), Harrison (2009), Kelleher (2012), Kruse (2004), Lapide (2002, 2004, 2005a, 2005b, 2009b), Lee (2013), Mansfield (2012), McLeod (2012), Mellen et al. (2010), Mello (2010), Mello and Stahl (2011), Mentzner and Moon (2004), Milliken (2008, 2011), Muzumdar and Fontanella (2006), Muzumdar and Wiswanathan (2009), Nearnberg (2011), Piechule (2008), Reed (2012), Sagar (2010), Schlegel and Murray (2010), Schubert (2011), Singh (2010), Smith et al. (2010), Stahl (2010), Stahl and Levine (2011), Stahl and Wallace (2012), Tinker (2010), Tohamy (2008), Van Hove (2012), Wallace (2006, 2011), Wallace and Stahl (2008), Warren (2012), Whisenant (2006), Willems (2012)
S&OP manual, governance	*Practitioner:* Bower (2012), Boyer (2009), Goodfellow (2012), Harrison (2009), Harwell (2006), Iyengar and Gupta (2013), Milliken (2011), Schubert (2011), Stahl (2010)
S&OP training, S&OP certification; S&OP academy, internal S&OP community; S&OP best practices	*Practitioner:* Boorman (2013), Goodfellow (2012), McLeod (2012), Mellen et al. (2010), Reyman (2005), Mansfield (2012), Milliken (2008), Tinker (2010)
Output and behavior control	
Key performance indicators (KPIs) to measure S&OP performance, S&OP process audit, plan accuracy	*Academic:* Affonso et al. (2008), Chen-Ritzo et al. (2010), Collin and Lorenzin (2006), Feng et al. (2008, 2010, 2013), Grimson and Pyke (2007), Hahn and Kuhn (2011, 2012a, 2012b), Ivert and Jonsson (2010), Nakano (2009), O'Leary-Kelly and Flores (2002), Singhal and Singhal (2007), Sodhi and Tang (2011), Thomé et al. (2012a, 2012b), Wang et al. (2012) *Practitioner:* Alexander (2013), Bower (2005, 2006, 2012), Boyer (2009), Halim (2011), Harwell (2006), Hobby and Jaeger (2013),

	Iyengar and Gupta (2013), Keen and Evans (2010), Kelleher (2012), Lapide (2002, 2004, 2005a, 2005b, 2011b), Mansfield (2012), McCall (2013), McCormack and Lockamy III (2005), McLeod (2012), Mellen et al. (2010), Mello (2010), Mello and Stahl (2011), Milliken (2008, 2011), Muzumdar and Fontanella (2006), Reyman (2005), Sagar (2010), Schlegel and Murray (2010), Schubert (2011), Smith et al. (2010), Stahl (2010), Stahl and Mansfield (2010), Tinker (2010), Tohamy (2008), Van Hove (2012), Wallace (2006), Wallace and Stahl (2008), Warren (2012), Whisenant (2006)
Maturity model, roadmap	*Academic:* Grimson and Pyke (2007), Thomé et al. (2012a)
Benchmarking against top performers	*Practitioner:* Alexander (2013), Halim (2011), Muzumdar and Wiswanathan (2009), Lapide (2005a), Tohamy (2008)
Outward focus, focusing to growth and innovation, market driven S&OP	*Practitioner:* Alexander (2013), Chase (2013), McCall (2013)
Joint S&OP process development, continuous improvement	*Academic:* Nakano (2009) *Practitioner:* Alexander (2013), Bower (2005, 2009), Halim (2011), Iyengar and Gupta (2013), Muzumdar and Fontanella (2006), Reed (2012), Reyman (2005), Schubert (2011), Stahl (2010), Tinker (2010)
Planning and data management	
Data, data format, data hierarchy, data accuracy, data quality, data availability, real-time data, data cleansing, data transparency	*Academic:* Grimson and Pyke (2007), Ivert and Jonsson (2010) *Practitioner:* Boyer (2009, 2011), Chase (2013), Harrison (2009), Harwell (2006), Iyengar and Gupta (2013), Kelleher (2012), Lapide (2005a), Mansfield (2012), Mellen et al. (2010), Milliken (2008), Muzumdar and Fontanella (2006), Muzumdar and Wiswanathan (2009), Nearnberg (2011), Ross (2003), Schubert (2011), Stahl (2010), Tohamy (2008), Warren (2012), Whisenant (2006)
IT tools, IT integration, IT platform, ERP, APS, Internet, portals	*Academic:* Affonso et al. (2008), Grimson and Pyke (2007), Ivert and Jonsson (2010), Singhal and Singhal (2007), Thomé et al. (2012b) *Practitioner:* Baumann and Andraski (2010), Bower (2012), Boyer (2009), Burrows III (2007), Chase (2013), Daviaud (2006), Goodfellow (2012), Halim (2011), Kruse (2004), Lapide (2004, 2005a, 2005b, 2006), McCall (2013), McCormack and Lockamy III (2005), Mellen et al. (2010), Mello (2010, 2013), Mentzner and Moon (2004), Muzumdar and Fontanella (2006), Muzumdar and Wiswanathan (2009), Piechule (2008), Reyman (2005), Singh and Lee (2013), Sorensen (2013), Tinker (2010), Tohamy (2008)
Demand plan, statistical baseline forecast, consensus forecast, aggregated forecast, unconstrained forecast, constrained forecast, top-down forecast, bottom-up forecast, promotion plan	*Academic:* Collin and Lorenzin (2006), Ivert and Jonsson (2010), Nakano (2009), Oliva and Watson (2011) *Practitioner:* Adamczak et al. (2013), Baumann and Andraski (2010), Baumann (2010), Bower (2005, 2006), Braun (2013), Burrows III (2007), Chase (2013), Daviaud (2006), Galluci (2008), Goodfellow (2012), Harwell (2006), Iyengar and Gupta (2013), Kruse (2004), Lapide (2002, 2004, 2005a, 2005b, 2006, 2013), Lee (2013), Mansfield (2012), McCall (2013), McCormack and Lockamy III (2005), Mello (2013), Mentzner and Moon (2004), Milliken (2008), Muzumdar and Fontanella (2006), Muzumdar and Wiswanathan (2009), Piechule (2008), Reyman (2005), Ross (2003), Sagar (2010), Schlegel and Murray (2010), Singh (2010), Singh and Lee (2013), Smith et al. (2010), Stahl (2010), Stahl and Levine (2011), Stahl and Kerber (2010), Stahl and Mansfield (2010), Stahl and Wallace (2012), Tinker (2010), Tohamy (2008), Wallace and Stahl (2008), Wallace (2006), Willems (2012)
Demand sensing, demand shaping, demand shifting	*Practitioner:* Chase (2013), Lapide (2013), McCall (2013)
Supply plan, aggregated production plan, rough-cut supply plan, production requirements, inventory planning	*Academic:* Chen-Ritzo et al. (2010), Singhal and Singhal (2007) *Practitioner:* Adamczak et al. (2013), Braun (2013), Chase (2013), Goodfellow (2012), Iyengar and Gupta (2013), Lapide (2002, 2004, 2013), Lee (2013), McCormack and Lockamy III (2005), Singh and Lee (2013), Stahl (2010), Stahl and Wallace (2012), Tohamy (2008), Willems (2012)
Scenario planning, simulation, risk planning, optimization, exception management, alerts, early warnings, gap closing actions, realigning resources	*Academic:* Affonso et al. (2008), Chen-Ritzo et al. (2010), Collin and Lorenzin (2006), Feng et al. (2010, 2013), Grimson and Pyke (2007), Hahn and Kuhn (2011, 2012a, 2012b), Ivert and Jonsson

	(2010), Singhal and Singhal (2007), Sodhi and Tang (2011), Thomé et al. (2012a, 2012b), Wang et al. (2012) *Practitioner:* Alexander (2013), Baumann (2010), Bower (2006), Bower (2012), Burrows III (2007), Chase (2013), Daviaud (2006), Dougherty and Gray (2013), Galluci (2008), Goodfellow (2012), Halim (2011), Keen and Evans (2010), Kelleher (2012), Lapide (2005b, 2009a, 2009b), Lee (2013), McCall (2013), Muzumdar and Wiswanathan (2009), Reed (2012), Ross (2003), Schlegel and Murray (2010), Singh (2010), Singh and Lee (2013), Sorensen (2013), Stahl (2010), Stahl and Mansfield (2010), Tinker (2010), Tohamy (2008), Wallace (2006), Warren (2012), Whisenant (2006)
One set of numbers, integrated financial plan, tight integration of financial planning and budgeting, multi-currency planning, exchange rates, pricing, price elasticity, input to investment planning, cash flow planning,	*Practitioner:* Alexander (2013), Bower (2005), Braun (2013), Chase (2013), Dougherty and Gray (2013), Goodfellow (2012), Harrison (2009), Lee (2013), McCormack and Lockamy III (2005), Muzumdar and Wiswanathan (2009), Reed (2012), Singh (2010), Sorensen (2013), Smith et al. (2010), Stahl and Wallace (2012), Tohamy (2008), Wallace and Stahl (2008), Whisenant (2006)
Planning unit, planning parameters, time horizon, time fences, categorization	*Academic:* Grimson and Pyke (2007), Ivert and Jonsson (2010) *Practitioner:* Alexander (2013), Baumann and Andraski (2010), Baumann (2010), Bower (2006), Boyer (2009), Braun (2013), Burrows III (2007), Chase (2013), Daviaud (2006), Dougherty and Gray (2013), Goodfellow (2012), Harrison (2009), Harwell (2006), Iyengar and Gupta (2013), Kelleher (2012), Lapide (2002, 2006, 2009a), Lee (2013), McCall (2013), Muzumdar and Wiswanathan (2009), Stahl and Wallace (2012)
Postponement, buffers	*Academic:* Collin and Lorenzin (2006)
Intraorganizational relations	
Cross-functional S&OP organization, cooperation and collaboration across functions	*Academic:* Affonso et al. (2008), Chen-Ritzo et al. (2010), Feng et al. (2008, 2010), Grimson and Pyke (2007), Hahn and Kuhn (2011, 2012a, 2012b), Ivert and Jonsson (2010), Nakano (2009), O'Leary-Kelly and Flores (2002), Oliva and Watson (2011), Thomé et al. (2012a, 2012b) *Practitioner:* Adamczak et al. (2013), Alexander (2013), Baumann and Andraski (2010), Boorman (2013), Bower (2005), Boyer (2009), Burrows III (2007), Chase (2013), Goodfellow (2012), Hobby and Jaeger (2013), Iyengar and Gupta (2013), Keen and Evans (2010), Kelleher (2012), Lapide (2004, 2005a, 2005b, 2009b, 2013), Lee (2013), Mansfield (2012), McCormack and Lockamy III (2005), Mellen et al. (2010), Mello (2010, 2013), Mentzner and Moon (2004), Milliken (2008, 2011), Muzumdar and Fontanella (2006), Muzumdar and Wiswanathan (2009), Nearnberg (2011), Reed (2012), Sagar (2010), Schlegel and Murray (2010), Schubert (2011), Singh (2010), Stahl (2010), Stahl and Wallace (2012), Tinker (2010), Tohamy (2008), Van Hove (2012), Wallace (2006, 2011), Wallace and Stahl (2008), Warren (2012), Whisenant (2006)
S&OP owner, S&OP sponsor, top management	*Practitioner:* Adamczak et al. (2013), Alexander (2013), Baumann and Andraski (2010), Boorman (2013), Bower (2005), Goodfellow (2012), Harrison (2009), Hobby and Jaeger (2013), Iyengar and Gupta (2013), Lapide (2011b), Lee (2013), Mansfield (2012), McCall (2013), McCormack and Lockamy III (2005), Mellen et al. (2010), Milliken (2008, 2011), Muzumdar and Fontanella (2006), Muzumdar and Wiswanathan (2009), Nearnberg (2011), Schubert (2011), Singh (2010), Stahl (2010), Stahl and Wallace (2012), Tinker (2010), Van Hove (2012), Wallace (2011), Whisenant (2006)
Interorganizational relations	
Collaborative Planning, Forecasting and Replenishment (CPFR); Vendor Managed Inventory (VMI); collaboration; external input; point of sales data (POS); demand visibility	*Academic:* Affonso et al. (2008), Collin and Lorenzin (2006), Grimson and Pyke (2007), Hadaya and Cassivi (2007), Nakano (2009) *Practitioner:* Baumann (2010), Baumann and Andraski (2010),, Chase (2013), Goodfellow (2012), Harrison (2009), Kruse (2004), Lapide (2004, 2005a, 2005b, 2009b, 2013), McCall (2013), McCormack and Lockamy III (2005), Mello (2013), Muzumdar and Fontanella (2006), Muzumdar and Wiswanathan (2009), Sagar (2010), Smith et al. (2010)
Integrative roles, network building	*Practitioner:* McCormack and Lockamy III (2005)

IT integration, portals, Internet	*Academic:* Affonso et al. (2008), Collin and Lorenzin (2006), Hadaya and Cassivi (2007) *Practitioner:* Goodfellow (2012), Lapide (2004, 2005a), Mello (2013), Muzumdar and Fontanella (2006), Muzumdar and Wiswanathan (2009), Tohamy (2008)
Collaboration strategy, partnership strategy, orchestration	*Academic:* Hadaya and Cassivi (2007) *Practitioner:* Chase (2013), Mello (2013), Smith et al. (2010)
Optimization	*Academic:* Feng et al. (2013), Wang et al. (2012)
Joint product development	*Academic:* Collin and Lorenzin (2006)
Informal communication	
Informal pre-meetings	*Academic:* Grimson and Pyke (2007)
Informal communication between individuals, teams and functions, informal teams	*Practitioner:* McCormack and Lockamy III (2005), Mello (2010)
Socialization	
Common, aligned business objectives, rewarding, incentives, S&OP linked to strategy	*Academic:* Grimson and Pyke (2007), Hadaya and Cassivi (2007), Ivert and Jonsson (2010), Oliva and Watson (2011) *Practitioner:* Alexander (2013), Bower (2005, 2012), Boyer (2009, 2011), Burrows III (2007), Chase (2013), Dougherty and Gray (2013), Goodfellow (2012), Harwell (2006), Iyengar and Gupta (2013), Lapide (2011b), Mentzner and Moon (2004), Milliken (2011), Muzumdar and Fontanella (2006), Muzumdar and Wiswanathan (2009), Nearnberg (2011), Piechule (2008), Reed (2012), Smith et al. (2010), Sorensen (2013), Stahl and Wallace (2012), Wallace and Stahl (2008), Van Hove (2012), Warren (2012), Whisenant (2006)
Common business assumptions	*Academic:* Oliva and Watson (2011) *Practitioner:* Alexander (2013), Bower (2005, 2006), Boyer (2009, 2011), Lapide (2004), McCall (2013), Mellen et al. (2010), Nearnberg (2011), Reed (2012), Smith et al. (2010), Stahl and Wallace (2012), Wallace and Stahl (2008)
Corporate culture and norms, top management example, commitment, trust, loyalty, positive feedback, change management	*Academic:* Hadaya and Cassivi (2007), Oliva and Watson (2011), Thomé et al. (2012b) *Practitioner:* Alexander (2013), Boorman (2013), Bower (2012), Boyer (2011), Goodfellow (2012), Harwell (2006), Hobby and Jaeger (2013), Iyengar and Gupta (2013), Lee (2013), Mansfield (2012), McCall (2013), McLeod (2012), Mellen et al. (2010), Mello (2013), Mentzner and Moon (2004), Muzumdar and Fontanella (2006), Stahl (2010), Stahl and Levine (2011), Stahl and Mansfield (2010), Stahl and Wallace (2012), Van Hove (2012)
Common S&OP vision	*Academic:* Grimson and Pyke (2007) *Practitioner:* Alexander (2013), Boorman (2013), Hobby and Jaeger (2013), Muzumdar and Fontanella (2006), Nearnberg (2011), Piechule (2008), Tinker (2010), Van Hove (2012);
Common understanding, learning, training, S&OP community, S&OP academy	*Academic:* Ivert and Jonsson (2010), Oliva and Watson (2011) *Practitioner:* Bower (2005, 2012), Boyer (2009), Goodfellow (2012), Iyengar and Gupta (2013), Keen and Evans (2010), Lapide (2007), McLeod (2012), Mellen et al. (2010), Mello (2013), Milliken (2008), Nearnberg (2011), Reyman (2005), Ross (2003), Sagar (2010), Schubert (2011), Wallace and Stahl (2008)
Collaborative manner, striving for consensus, empowerment, competence when dealing with conflicts, constructive engagement, internal relations, discussions and debating	*Academic:* Oliva and Watson (2011), Thomé et al. (2012b) *Practitioner:* Alexander (2013), Bower (2005), Goodfellow (2012), Harrison (2009), Lee (2013), Mansfield (2012), Mellen et al. (2010), Mello (2010, 2013), Stahl (2010), Stahl and Wallace (2012), Stahl and Levine (2011), Van Hove (2012)

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