Sales and Operations Planning: A Business Practice to Align Supply Chains

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Abstract—Purpose: To summarize the existing knowledge in the scientific literature about the relationship between Sales and Operation Planning (S&OP) and alignment of the stakeholder in the supply chains.

Design/methodology/approach: Bibliometric research using text mining over 37 selected papers, Scimago Journal Rank Q4 or better.

Findings: Our findings suggest that the relationship between S&OP and alignment has rarely been studied in the academic literature.

Research limitations: These results indicate the need for more study to build a theory for alignment based in Sales in Operations Planning practice.

Practical implications: This paper presents a research agenda to close the gap between practice and promise in supply chain management.

Paper type: Literature review.

Originality/value: This paper makes two specific contributions to the literature. First, it provides an agenda for research in functional alignment in the Supply Chain; and next: promotes the need to capitalize on the advantages offered by text mining in the operations planning field.

Keywords—Sales and Operations Planning; S&OP; alignment; tactical planning; supply chain.

I. INTRODUCTION

To successfully face the current competitive environment, companies need to adjust and detail frequently their operational plans, and S&OP can perform coordination of the supply chain for a competitive performance (Wang, Hsieh, & Hsu, 2012). S&OP is also defined as the process of developing “tactical plans that assist management in strategically directing the business to achieve continuous competitive advantage” (APICS, 2011:53). Researchers suggest that S&OP is a good practice to make decisions that respond to frequent changes in demand, cost, or other characteristics of market delivery (Coker & Helo, 2016).

S&OP process does not have a consensus definition among researchers and practitioners. However, scientific literature agrees that its main purpose is to align functional plans—even those part of the supply chain—seeking positive impacts in the use of resources, operating costs, and response to the market (de Almeida, Marins, Salgado, Santos, & da Silva, 2015; Hollmann, Scavarda, & Thomé, 2015; Kjellsdotter Ivert & Jonsson, 2010; Kristensen & Jonsson, 2018; Moon & Allw, 2015; Sombultawee & Boonit, 2018; Steinrücke & Jahr, 2012).

Recent literature considers the vertical and horizontal alignment of functional plans a key element of S&OP in different industrial sectors and companies. This is even extended to the external functions of the supply chain (Wagner, Ulrich, & Transchel, 2014).

The purpose of this article is to summarize the existing knowledge in the scientific literature about the relationship between S&OP and alignment of the stakeholder in the supply chains. This research is a bibliometric study on selected academic papers. It finds that the S&OP seeks horizontal and vertical alignment in the supply chain, but it doesn’t describe detailed specifications of the way in which the alignment takes place, because, despite the wide literature on S&OP, little has been published on how to enable functional alignment through S&OP practice.
Literature makes clear that alignment is mandatory and a quality difficult to achieve in the practice, even if it might seem simple at first sight (Wagner et al., 2014). A better understanding of how alignment occurs would allow managers to react quickly to changes in the competitive environment.

II. LITERATURE REVIEW

The S&OP is part of the disciplines of operations planning (Olhager, 2013), and its first references in the scientific literature date from the end of the last century (Thomé et al., 2012). The selected literature does not refer to a single S&OP model, but to its different interpretations according to the context in which it is applied (Thomé et al., 2012). The characteristic that is shared between the different interpretations, is that it produces alignment among the business stakeholders (Wagner et al., 2014).

2.1 - Operations Planning

The focal point in operations planning has evolved from a basic level to a more complex one: from Shop Floor Control in the 1960s, to Supply Chain Planning in 2000s, S&OP practice was the focal point during the 1990s (Figure 2). In their search for greater competitiveness, organizations have increasingly incorporated a greater number of criteria to make the most of their operating resources (Olhager, 2013).
2.2 Sales and Operations Planning

The Council of Supply Chain Management Professionals—a leading professional association for supply chain and operations—defines S&OP as a process that "reconciles conflicted business objectives" (Vitasek, 2013). In the same way, Tuomikangas and Kaipia (2014) point out that S&OP is a valuable process for achieving business’ strategic objectives. The alignment of tactical plans in different departments of the organization allows establishing a link between the short-term goals and the strategic objectives of the company to maximize results (Wagner et al., 2014).

The practice of S&OP has its background during the 1950s decade, specifically at Holt, Modigliani, Muth and Simon's work on operations management (Noroozi & Wikner, 2012). S&OP literature started in 1998 (Thomé et al., 2012) at an upward in from 1998 to 2010 (Figure 3).

2.3 Contextual design

Has been established that S&OP can have different objectives in different companies; and that the process and its activities are also changeable, especially when they respond to the conditions of the industrial sector and the company’s strategy (Thomé et al., 2012). The investigation of operational planning and S&OP has been carried out on different industrial sectors (Table 1).

![Fig.3: Number of publications on S&OP per year in Google Scholar](source: Thomé et al, 2012)

| Dairy | (Nemati, Madhoshi, & Ghadikolaei, 2017) |
|---|---|
| Cosmetics | (Hulthen et al., 2016; Rojas & Hazin, 2014) |
| Discrete Manufacturing | (Noroozi, 2017; Noroozi & Wikner, 2016) |
| Process Industry | (Noroozi & Kumar, R. and Srivastava, 2014; Noroozi & Wikner, 2012, 2017) |
| Paper | (Naslund & Williamson, 2017) |
| Reverse Clothing Supply Chain | (Sandberg, Pal, & Hemilä, 2018) |
| Grocery Retailing | (Dreyer, Kiil, Dukovska-Popovska, & Kaipia, 2018) |

Source: Own elaboration, 2018.
Due to the nature of its context-based design (Kristensen & Jonsson, 2018), in literature, S&OP practice is named in various ways through literature (table 2).

Table 2: Names used to refer practice of S&OP

| SIOP | Sales operations and inventory planning |
|------|----------------------------------------|
| IBP  | Integrated business planning; profit, sales, and operations planning; Supply chain sales and operations planning; Sales/production sales and operations planning; Global sales and operations planning; Executive sales and operations planning |
| DSI  | Demand and supply integration |

Source: Own elaboration with information of Kristensen and Jonsson, 2018.

2.4 Alignment

Alignment, together with agility and adaptability, allows organizations to deal favorably with changes in the competitive environment (Dubey, Altay, Gunasekaran, Papadopoulos, & Childs, 2017), linking the long-term strategic goals with the planning of short-term operations (Danese, Molinaro, & Romano, 2017). Alignment is favored by management’s commitment to establish incentives (Panahifar, Heavey, Byrne, & Fazlollahtabar, 2015), to provide connectivity to the supply chain and exchange information (Dubey et al., 2017).

The alignment of organizations occurs at three levels: strategic, tactical, and operational (Sombultawee & Boon-it, 2018). Top management must establish an adequate governance structure for executing the customer value creation strategy, by aligning the stakeholders with the clients. There is no generalized theory about alignment that can be applied (Sombultawee & Boon-it, 2018), it is a non-unidirectional process, involving work and learning (Selviaridis, Spring, & Authors, 2018). Alignment is a complex result, although literature points out that the alignment between stakeholders is important to improve business performance, there are other types of alignment that must be considered (Skipworth, Godsell, Wong, Saghiri, & Julien, 2015) and on which it is necessary to deepen the current knowledge.

Collaboration for alignment in practice planning is affected by different variables (Table 3) on their own reach and depth (Hollmann et al., 2015; Kristensen & Jonsson, 2018; Nabil, El Barkany, & El Khalifi, 2018).

Table 3: Factors affecting collaboration in planning

- Demand elasticity.
- Market uncertainty and lead times.
- Goals of the process: responsiveness vs efficiency.
- Supply uncertainty.
- Supply Chain spatial complexity: number of partners and geographical distance.
- Company complexity: firm size.
- Hierarchical planning framework: linking strategic planning with tactical planning or tactical planning with the operational plan.
- The maturity of planning framework.
- Organizational characteristics: human, technological and characteristics of the organization: external and internal integration.
- A number of products: same or different products.

Source: Own elaboration, with information of Hollmann et al., (2015); Kristensen & Jonsson, (2018); Nabil et al., (2018); Wagner et al., (2014).

III. RESEARCH METHODOLOGY

The methodology applied is a bibliometric study in 4 steps (Figure 4). In the first step, 37 documents of ProQuest and EBSCOhost Research Databases were selected with the search terms “Sales and Operations Planning”; “Sales &Operations Planning”; “S&OP” and “Supply Chain Alignment”. The search was also limited to articles published from the year 2014 onwards and to journals ranked in Scimago Journal Rank on Q4 or better.

For steps 2 to 3 the text mining system “Enterprise Miner 14.1” Advanced Analytics Software | SAS (https://www.sas.com/) was used processing summary, author, year of publication, journal, and ranking of the journal of selected research.

The second step was Text Parsing and Filter, to quantify selected information about the terms that are contained in abstracts. The third step was Clustering data, classifying and establishing relationships between the concepts contained in the selected documents.

The fourth step was the analysis of the processed information.
IV. RESULTS

The number of papers from 2013 to 2017 is between 6 and 9, the data from 2018 is partial to March (figure 4).

The documents were selected from 22 journals, 1 of them contributed with 5 papers (International Journal of Physical Distribution and Logistics Management), 16 of them with only 1 (Appendix 1). 14 journals and 28 papers belong to the rank Q1 (Figure 5).

The authors of the papers are 104 and they are in 20 countries (Appendix 2). Most of the contributions are from Sweden (14%), and the USA (13%) while 66% of the authorship is covered in 6 countries: USA, United Kingdom, Finland, Brazil and Denmark (Figure 6).
The term “Sales and Operations Planning” appears with a frequency of 147 in 20 papers; the term ‘alignment’ appears with a frequency of 41 in 11 papers and the term ‘supply chain’ appears 51 times in 19 papers (Figure 7).

Cluster analysis, obtained with the Expectation-Maximization clustering algorithm with using a Hierarchical clustering algorithm, with 4 descriptive terms, produced 5 clusters (Table 4).
The relationship of the frequency and quality of the grouping measured with the Root Mean Square Standardized (RMS Std.) is shown in Figure 9, and in Figure 10 the frequency of the clusters in the analyzed documents is shown.

### Table 4: Clusters

| Cluster | Descriptive terms | Frequency | RMS Std. |
|---------|------------------|-----------|----------|
| 1       | [strategic] [tactical] [alignment] [coordination] | 8         | 0.18565  |
| 2       | [maturity] [Sales and Operations Planning] [plan] [market] | 11        | 0.191357 |
| 3       | [operations] [function] [Cross Functional] [demand] | 4         | 0.194552 |
| 4       | [Tactical planning] [integration mechanism] [Supply Chain Management] [supply chain] | 9         | 0.301199 |
| 5       | [Operations Planning] [contextual] [uncertainty] [Supply Chain Management'] | 5         | 0.22495  |

Source: Own elaboration, 2018.

**Fig.8: Concept linking between S&OP, Supply Chain and Alignment**

**Source:** Own elaboration, 2018

**Fig.9: Relationship of the frequency and quality of the clustering**

Source: Own elaboration, 2018.
THROUGH THE ANALYSIS OF TEXT MINING, IT WAS NOT POSSIBLE TO FIND A DIRECT RELATIONSHIP BETWEEN THE TERMS: "ALIGNMENT" AND "S&OP" (FIGURE 8). "ALIGNMENT" APPEARS IN CLUSTERS ANALYSIS IN THE RELATIONSHIP WITH TERMS: "STRATEGIC", "TACTIC" AND "COLLABORATION", WHICH REVEALS THE AREAS OF INTEREST THAT ACADEMICS HAVE RELATED WITH THE TERM ALIGNMENT IN THEIR RESEARCHES.

S&OP FORMS THE CLUSTER MOST FREQUENTLY WITH 'MATURITY', 'PLAN' AND 'MARKET': 30% (FIGURE 10). MATURITY IS ONE OF THE FACTORS THAT AFFECT COLLABORATION (TABLE 3), SO WE CAN SUSPECT THAT THE RESEARCH IN S&OP HAS AN IMPORTANT ORIENTATION TO THE MATURITY OF THE PLANNING PROCESS AND ITS RELATIONSHIP WITH THE MARKET.

VI. CONCLUSION

This manuscript establishes a broad field of research because the alignment of the stakeholders is an important factor for the maintenance and development of competitiveness. The construction of a theory about how the alignment is achieved will allow practitioners to improve the performance of their businesses. This manuscript also opens the way to the use of text mining technology in the field; sparingly used to date. In futures researches, it is convenient to consider a greater number of articles, to expand the amount of text considered in each document, not to limit it to the summaries and to extend the range of years considered to identify trends with greater clarity; and above all: to make a deeper use of the text mining tool.

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**Appendix 1**

Journals, SJR Rank and papers

| SJR Rank | Journal | No. Docs. |
|----------|---------|-----------|
| Q1       | International Journal of Physical Distribution and Logistics Management | 6 |
| Q1       | Journal of Business Logistics | 3 |
| Q1       | International Journal of Production Research | 3 |
| Q1       | International Journal of Operations and Production Management | 3 |
| Q1       | International Journal of Production Economics | 3 |
| Q1       | International Journal of Logistics Management | 2 |
| Q1       | Production Planning and Control | 1 |
| Q1       | Computers in Industry | 1 |
| Q1       | Business Horizons | 1 |
| Q1       | Journal of Operations Management | 1 |
| Source: Own elaboration, 2018. |

### Appendix 2

**Authors, country papers sorted by number of papers, country and name**

| Author                      | Country                  | Total | Author                      | Country                  | Total |
|-----------------------------|--------------------------|-------|-----------------------------|--------------------------|-------|
| Kaipia, Riikka              | Finland/Sweden           | 5     | Nabil, Lahloua              | Morocco                  | 1     |
| Dukovska-Popovska, Iskra    | Denmark                  | 3     | El Barkany, Abdellah        | Morocco                  | 1     |
| Dreyer, Heidi Carin         | Norway                   | 3     | El Khalfi, Ahmed            | Morocco                  | 1     |
| Thomé, Antônio Márcio Tavares | Brasil                  | 2     | Chabada, Lukas              | Norway                   | 1     |
| Holmström, Jan              | Finland                  | 2     | Kiil, Kasper                | Norway                   | 1     |
| Tuomikangas, Nina           | Finland                  | 2     | Sousa, Rui Soucasaux        | Portugal                 | 1     |
| Fredriksson, Anna           | Sweden                   | 2     | Sandberg, Erik              | Sweden                   | 1     |
| Ivert, Linea Kjellsdotter   | Sweden                   | 2     | Norman, Andreas             | Sweden                   | 1     |
| Da Silva, Andrea Lago       | Brasil                   | 1     | Näslund, Dag               | Sweden                   | 1     |
| da Silva, Sérgio Luis       | Brasil                   | 1     | Noroozi, Sayeh              | Sweden                   | 1     |
| de Almeida, Marly MizueKaibara | Brasil                | 1     | Pal, Rudrajeet              | Sweden                   | 1     |
| Do Carmo, Luiz Felipe Roris Rodriguez Scavarda | Brasil | 1 | Hulthen, Hana | Sweden | 1 |
| Salgado, Andréia Maria Pedro | Brasil                  | 1     | Johansson, Mats I.          | Sweden                   | 1     |
| Scavarda, Luiz Felipe       | Brasil                   | 1     | Kjellsdotter Ivert, Linea   | Sweden                   | 1     |
| Pedroso, Carolina Belotti   | Brasil                   | 1     | Kristensen, Jesper          | Sweden                   | 1     |
| Hollmann, Roberto Luis      | Brasil                   | 1     | Wikner, Joakim              | Sweden                   | 1     |
| Santos, Fernando César Almada | Brasil              | 1     | Wagner, Stephan M.           | Switzerland              | 1     |
| Marins, Fernando Augusto Silva | Brasil           | 1     | Boon-itt, Sakun             | Thailand                 | 1     |
| Gaudreault, Jonathan        | Canada                   | 1     | Sombultawee, Kedwadee       | Thailand                 | 1     |
| Thomas, André               | Canada                   | 1     | Childe, Stephen J.          | United Kingdom           | 1     |
| Wery, Jean                  | Canada                   | 1     | Christopher, Martin         | United Kingdom           | 1     |
| Damgaard, Cecilie Maria     | Denmark                  | 1     | Selviaridis, Kostas         | United Kingdom           | 1     |
| Sablón Cossío, Neyfe        | Ecuador                  | 1     | Wong, Chee Yew              | United Kingdom           | 1     |
| Coker, Joakim               | Finland                  | 1     | Papadopoulos, Thanos        | United Kingdom           | 1     |
| Helo, Petri                 | Finland                  | 1     | Eldridge, Stephen           | United Kingdom           | 1     |
| Rajala, Risto               | Finland                  | 1     | Godsell, Janet              | United Kingdom           | 1     |
| Hemilä, Jukka               | Finland                  | 1     | Goh, Shao Hung              | United Kingdom           | 1     |
| Smäros, Johanna             | Finland                  | 1     | Blomé, Constantin           | United Kingdom           | 1     |
### Appendix 2

*Authors, country papers sorted by number of papers, country and name*

| Author                          | Country    | Total | Author                          | Country    | Total |
|---------------------------------|------------|-------|---------------------------------|------------|-------|
| Dubey, Rameshwar                | France     | 1     | Ryals, Lynette J.               | United Kingdom | 1     |
| Penz, Bernard                    | France     | 1     | Saghiri, Soroosh                | United Kingdom | 1     |
| Laurent Lim, Lâm                | France     | 1     | Spring, Martin                  | United Kingdom | 1     |
| Marier, Philippe                 | France     | 1     | Skipworth, Heather              | United Kingdom | 1     |
| Alpan, Gülgün                    | France     | 1     | Julien, Denyse                  | United Kingdom | 1     |
| Ullrich, Kristoph K R            | Germany    | 1     | Tarafdar, Monideepa             | United Kingdom | 1     |
| Transchel, Sandra                | Germany    | 1     | Qrunfleh, Sufian                | USA        | 1     |
| Nemati, Yaser                    | Iran       | 1     | Roh, Joseph                     | USA        | 1     |
| Ghadikolaei, Abdolhamid Safaei   | Iran       | 1     | Tate, Wendy Lea                 | USA        | 1     |
| Madhoshi, Mehrdad                | Iran       | 1     | Ralston, Peter M.               | USA        | 1     |
| Turkulainen, Virpi               | Ireland    | 1     | Rutherford, Brian N.            | USA        | 1     |
| Danese, Pamela                   | Italy      | 1     | Esper, Terry L.                 | USA        | 1     |
| Chiarini, Andrea                 | Italy      | 1     | Whipple, Judith M.              | USA        | 1     |
| Romano, Pietro                   | Italy      | 1     | Murfield, Monique L.U.          | USA        | 1     |
| Vagnoni, Emidia                  | Italy      | 1     | Grawe, Scott J.                 | USA        | 1     |
| Molinaro, Margherita             | Italy      | 1     | Gunasekaran, Angappa            | USA        | 1     |
| Bakar, Abu                       | Malaysia   | 1     | Plank, Richard E.               | USA        | 1     |
| Hamid, Abdul                     | Malaysia   | 1     | Richey, R. Glenn                | USA        | 1     |
| Talib, Ab                        | Malaysia   | 1     | Hooker, Robert                  | USA        | 1     |
| Syazwan, Mohamed                 | Malaysia   | 1     | Scott C. Ambrose                | USA        | 1     |
| Bautista Santos, Horacio         | México     | 1     | Swink, Morgan                   | USA        | 1     |
| Fernández Lambert, Gregorio      | México     | 1     | Stolze, Hannah J.               | USA        | 1     |
| Bernabé Loranca, María Beatriz   | México     | 1     |                                |            |       |
| Sánchez Galván, Fabiola          | México     | 1     |                                |            |       |
| Martínez Flores, José Luis       | México     | 1     |                                |            |       |

Source: Own elaboration, 2018.