



The game plan for aligning the organization

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KEYWORDS

Plan alignment;
Sales and operations
planning;
Organizational change;
Multi-method research;
Medical products;
Balancing supply and
demand

Abstract Better-aligned operational and strategic plans and a better balance of supply and demand bring tangible benefits to firms. However, functional departments in firms often operate without vertical and horizontal alignment. The outcomes are delays and amplification of the information flow, suboptimal corporate plans, uncoordinated reactions within the business, insufficient operational flexibility, and discrepancies in supply and demand. Sales and operations planning (S&OP) can circumvent these negative consequences and align the organization. Our multi-method research develops a holistic S&OP maturity model that firms can use for the assessment of their internal S&OP processes and shows the pathway to an integrated S&OP approach for the achievement of a better-aligned organization. We present a case study of a medium-sized, Swiss-based pharmaceutical company that has recently implemented S&OP to highlight why companies implement S&OP, the prerequisites and roadblocks encountered during implementation, and the benefits envisioned and achieved. Finally, we reveal the great relevance of the topic by means of a questionnaire survey which shows that organizations' current S&OP performance is underdeveloped and that many improvements are indispensable to enjoy all benefits associated with the alignment process.

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1. Introduction

Nothing is more important for a product-based firm than the ability to deliver the right quantities of the right product to the right customer at the right time without stockpiling unnecessary inventory. This

requires a continuous and balanced matching of product supply and demand.

Supplying products entails the sourcing of raw materials or components on the market and manufacturing or assembling the final product for shipment to the customers. Given frequent shortages or the increased volatility on the supply market, supply is by no means predictable and stable (Christopher & Holweg, 2011). At the same time, business cycles, changes in customer demand, and product launches create uncertainty on the sales market and challenge the demand forecasts that are

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used for supply planning (Makridakis, Hogarth, & Gaba, 2010; Navarro, 2005).

Better-aligned operational and strategic plans and a better balance of supply and demand would benefit firms in the forms of smaller inventories, higher utilization, lower costs, and happier customers. It would also increase firms' competitive advantage. However, even today many organizations still operate under central control through functional departments. The linkage between sales and operations especially requires better integration and collaboration across operational silos. The outcomes of this disjointedness are delays and amplification of the information flow, suboptimal corporate plans, uncoordinated reactions within the business, insufficient operational flexibility, and discrepancies in supply and demand (Kaplan & Norton, 2001).

Insights from our case study exemplify the challenges to firms. The 150-year-old, family-owned Swiss firm Geistlich Pharma is a manufacturer of medical products, an innovator in orthopedics, and a world market leader in regenerative dentistry. The firm has a worldwide sales network with six subsidiaries, more than 50 sales partners, and years of steady growth.

When there was no economic pressure on the company to compel changes in prevailing behaviors and attitudes, it established a legacy corporate structure—with conventional functional departments—and bypassed opportunities for optimization. The sales department saw that a product was selling well, but their colleagues in production did not. Meanwhile, the sales teams had no inkling that no goods were ready on the production floor. Eleventh-hour efforts could prevent stockouts, but this was not the most efficient way to work. For its part, the production department worked according to a budget plan, but after only 2 weeks, the budget figures were outdated and there were real orders to fill. This led to stockouts of raw materials.

Things worsened when the economic challenges of the global markets increased. Planners at Geistlich Pharma had to cope with long delivery lead times for its raw materials to guarantee product availability internationally. This pressure was accompanied by increased time pressure for perishable medical products with strict expiration dates. At the same time, production aimed for the highest possible utilization of both its infrastructure and its workers. These local targets drove up inventories. As it turned out, each department was capable of undermining the company's business results by pursuing its own interests. The cost-driving effect was unintentional, even though everyone fully knew that a plan made just once a year would never fit

reality. When the operations teams delivered the goods by holding coordination meetings, fire-fighting, and taking corrective actions under high pressure, Geistlich Pharma's CEO realized that a new game plan was needed: the S&OP implementation project.

Since companies continually struggle with misaligned organizational plans and costly discrepancies between supply and demand in volatile and uncertain times, organizational changes are inevitable. However, many do not reap the full benefits of S&OP when it has been implemented half-heartedly. At the same time, S&OP is not an all-or-nothing approach. Firms should continually improve the alignment process. In order to help with these endeavors, we present a holistic S&OP maturity model that firms can use for assessment. Additionally, the model shows the pathway to an integrated S&OP approach and a better-aligned organization.

2. About the research

Following recent recommendations, the work presented herein draws on multiple methodologies—in order to compensate for the limitations of using a single method—to develop a complete understanding of S&OP as our phenomenon of study and generate novel insights contributing to the S&OP literature (Sanders & Wagner, 2011). First, we conducted an in-depth case study of a Swiss-based pharmaceutical company to arrive at an initial understanding of S&OP, why companies implement S&OP, the prerequisites and roadblocks encountered during implementation, and the benefits envisioned and achieved (Wagner, Zanon, & Thakur-Weigold, 2010). The company was chosen because it had recently implemented S&OP; plus, it is medium-sized, which allowed us to get a good overview of the entire firm and better understand the interrelationships among departments. Second, we performed a literature review on S&OP by searching databases such as Emerald, EBSCO, and ScienceDirect. The literature was screened for relevance and either integrated in the background section of this article or utilized as the foundation for our maturity model. Third, we conducted 20 semi-structured interviews—based on the suggestions of Fontana and Frey (1994)—with seven supply chain and operations management experts from an international management and technology consultancy well known for S&OP implementation and optimization projects. The purpose of the interviews was to develop and detail various dimensions and sub-dimensions of the maturity model. To identify these, the data collected was subjected to an iterative

Table 1. Sample demographics

	Frequency	Percent
Process industry sector		
Chemicals and chemical products	28	31.8%
Pharmaceutical products and preparations	24	27.3%
Food products	12	13.6%
Paper and paper products	7	8.0%
Rubber and plastic products	7	8.0%
Basic metals	6	6.8%
Other	4	4.5%
Country		
Germany	41	46.6%
Belgium	11	12.5%
France	11	12.5%
Switzerland	6	6.8%
UK	6	6.8%
Netherlands	5	5.7%
Finland	5	5.7%
Other	3	3.4%
Firm size (revenues 2011 in million Euros)		
< 100	1	1.1%
101–500	21	23.9%
501–1,000	42	47.7%
1,001–5,000	17	19.3%
> 5,000	5	5.7%
N/A	2	2.3%

coding procedure such that all relevant aspects and activities of S&OP are comprised in the (sub-)dimensions to facilitate a holistic view from different perspectives on the process. Furthermore, through the interviews we gleaned insights from experienced practitioners on how to evaluate and measure S&OP maturity, which helped us to augment the insights garnered from the literature with current trends and issues related to S&OP. Finally, an online questionnaire survey was administered to (1) understand the benefits of a well-implemented S&OP process, (2) to get an assessment of firms' S&OP maturity levels and their deficiencies, and (3) to identify the most critical dimensions of the S&OP maturity model. The questionnaire items operationalize the S&OP maturity levels with multiple items, and both the items and the questionnaire were pre-tested for ambiguity and ease of comprehension by practitioners and academics.

Since product types and their supply and demand characteristics determine the predominant operational and supply chain processes in an industry (Wagner, Grosse-Ruyken, & Erhun, 2012), with differences largely in discrete manufacturing industries (e.g., machinery, automotive) versus process industries (e.g., pharmaceutical, chemicals), we focused our survey—and our case study—on the

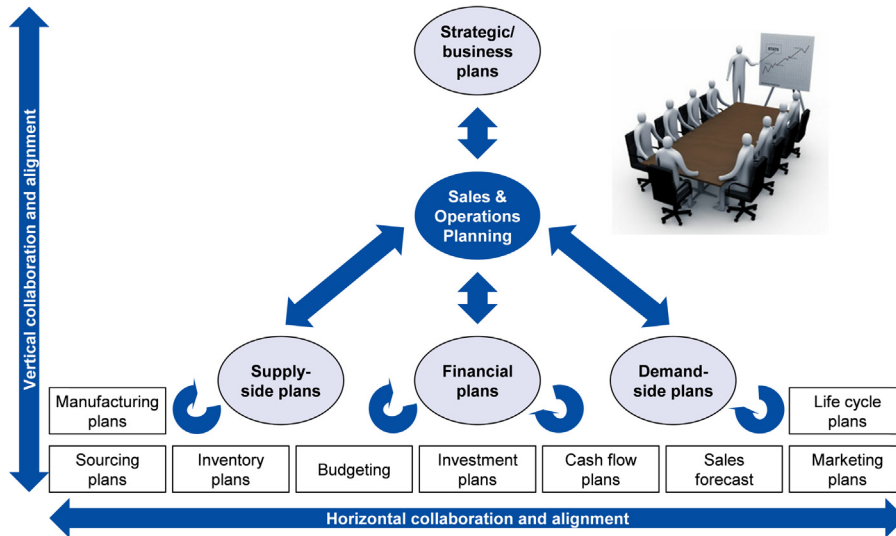
latter in order to obtain a homogenous sample of firms. Nevertheless, there is an acceptable amount of variation since the surveyed firms came from different process industry sectors and countries, and varied in size and S&OP experience (Table 1). Of the 300 firms in the sampling frame, 88 responded: a response rate of 29.3%. The sample includes such well-known companies as Bayer, Novartis, and GlaxoSmithKline as well as numerous medium-sized firms.

3. Sales and operations planning (S&OP)

3.1. Background

Many companies face the challenge of establishing a comprehensive game plan for each business function to guide the organization in one direction. The difficulty arises from the lack of a structured and iterative process for building a single consensus forecast as the basis for all further activities. Consequently, supply and demand are out of balance (Muzumdar & Fontanella, 2006). When demand exceeds supply, the results will be products going out of stock, large order backlogs, missed sales, long

Figure 1. Alignment of plans through S&OP



lead times, schedule overruns, and premium freight charges to compensate for shortages. At the same time, error rates may rise due to companies trying to ship products as soon as possible. Thus, costs increase and customer service deteriorates. In contrast, when supply exceeds demand, inventories increase, carrying costs rise, more products may perish or become obsolete, and cash flow problems might occur. In addition, profit margins are squeezed due to discounts and more frequent promotions to sell out stocks. Finally, layoffs may become inevitable, demoralizing employees and reducing productivity.

S&OP as a top management tool regularly tackles these issues. The phrase ‘sales and operations planning’ was originally used in the context of manufacturing resource planning (MRP II). It has since been used synonymously with aggregated production planning (APP), from which S&OP conceptually evolved. S&OP has two major components: (1) the sales plan, based on forecasted demand, and (2) the manufacturing plan, which determines capacity requirements, inventory levels, and/or order backlogs. In addition to the horizontal alignment of plans and collaboration among departments to generate a single integrated set of plans, the process links an organization’s long-term strategic and short-term operational plans to achieve and sustain competitive advantage: vertical alignment and collaboration (Thomè, Scarvada, Fernandez, & Scarvada, 2012a). We would further insist that the finance function needs to be represented in S&OP meetings in order to facilitate the joint determination of budgets and other financial targets (e.g., Singh, 2010) because—next to the ‘interim goal’ of balancing, integrating, and communicating plans throughout the organization—the objective of S&OP is to

maximize profits. As defined by Cox and Blackstone (2004, p. 103), the purpose of S&OP is:

To develop tactical plans that provide management the ability to strategically direct its businesses to achieve competitive advantage on a continuous basis by integrating customer-focused marketing plans for new and existing products with the management of the supply chain. The process brings together all the plans for the business (sales, marketing, development, manufacturing, sourcing, and financial) into one integrated set of plans.

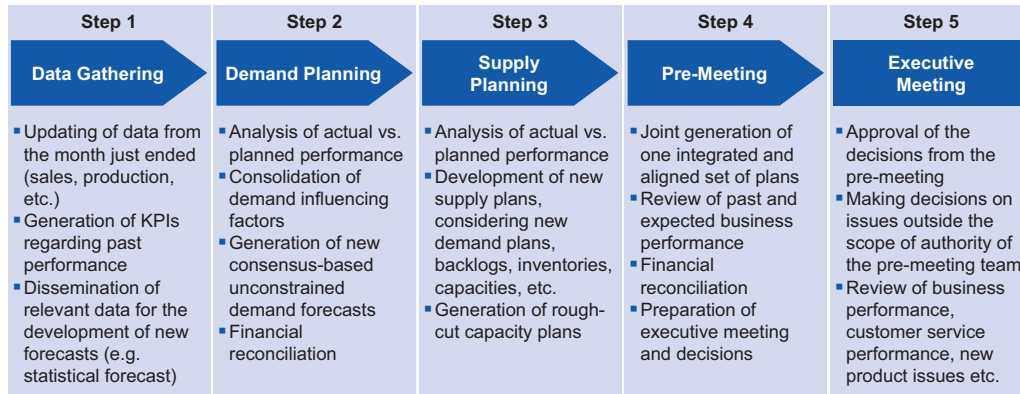
Figure 1 illustrates the vertical and horizontal alignment of the various plans.

3.2. The S&OP process: How to balance supply and demand

S&OP is an ongoing process of monthly planning, reviewing, and evaluation to generate one set of integrated profit maximizing plans by ensuring the involvement of all key stakeholders. These plans comprise the game plan for each business function, whilst business performance is regularly reviewed, in order to strategically direct the organization. The process facilitates the sending of early warning signals when supply and demand are at risk of becoming imbalanced so that the company can respond quickly to changing market and operations situations. S&OP consists of five steps, shown in Figure 2 (e.g., Lapide, 2011; Wallace & Stahl, 2008).

Data gathering comprises the preparation, consolidation, and dissemination of data for use in other phases of the process, primarily performed automatically by IT systems. On these grounds, it is

Figure 2. The S&OP process



typically performed at the end of a month. It includes updating data from the month just ended (e.g., actual sales, production, inventories) and generating key performance indicators (KPIs) and other reports to evaluate past business performance (e.g., forecast error, actual production rates). Finally, information is consolidated according to the planners' requirements and disseminated (Lapide, 2004).

In the *demand planning* phase, marketing and sales people jointly analyze and discuss the data gathered at step one so as to generate the new consensus-based unconstrained baseline demand forecast for at least the next 12 months. The forecast needs to be adjusted for new product introduction and cannibalization effects, expected responses to promotional activities, and external factors. Moreover, forecast errors and planning assumptions should be regularly reviewed within this phase. Last but not least, the new forecasts have to be converted into monetary terms to facilitate continuous financial reconciliation with business plans on a monthly basis (Dougherty & Gray, 2006).

Supply planning occurs in parallel to the demand planning phase. Here, operations people compare actual to planned performance (e.g., inventory levels, capacity utilization), analyze potential deviations, and validate underlying assumptions, such as processing speeds. Based on this information and on the new sales forecast, operations people modify supply plans with regard to customer order backlogs, inventory levels, material and/or capacity availability, production and lead times, and other contingencies. Additionally, manufacturing resource planning (MRP II) or similar resource requirements planning modules are utilized to generate a 'rough-cut capacity plan' (Wallace & Stahl, 2008).

In the *pre-meeting*, a cross-functional team of representatives from demand and supply side organizations, new product development, finance, and the S&OP process owner convene to discuss, adjust, and validate supply and demand plans. In this

environment, decisions pertaining to the balancing of supply and demand can be made within the framework of policies, strategies, and the business plan so that a single set of aligned recommendations can be presented in the executive meeting. In addition, an updated financial report of the business is generated to regularly compare actual performance against the business plan. Finally, attendees prepare the material to be presented in and set the agenda for the executive meeting (Dougherty & Gray, 2006).

In the *executive meeting*, all members of the executive board meet the S&OP process owner to review and possibly modify all decisions from the pre-meeting. Participants review crucial KPIs and reconcile the dollarized version of the new set of plans with the business plan. On these grounds, it will be decided which plans and/or strategies to adjust in case of deviations. In addition, decisions on which the pre-meeting team could not reach consensus or which entail significant costs or other consequences are collectively made and approved by top management.

4. The benefits of S&OP

The major outcome and benefit of S&OP is a vertically and horizontally aligned set of marketing, development, manufacturing, sourcing, and financial plans that enable the ongoing balancing of supply and demand. Through mathematical models and empirical investigations, scholars have shown the positive impact of S&OP on the performance of firms. Those findings are substantiated by publications from practitioners and consultancies, which also report significant improvements along a broad range of KPIs (Thomé, Scarvada, Fernandez, & Scarvada, 2012b).

In order to obtain a more comprehensive understanding of S&OP's benefits, we interviewed supply chain and operations management experts and

Table 2. Benefits of S&OP

S&OP is expected to significantly. . .	Mean (M)	Standard Deviation (SD)
• increase forecast accuracy	4.80	0.53
• increase supply chain visibility and hence reduce the risk of supply chain disruption	4.59	0.58
• reduce inventory levels and thus cost of capital while maintaining or improving customer service levels	4.45	0.68
• improve customer satisfaction levels	4.31	0.82
• improve product availability for marketing and promotional campaigns	4.27	0.89
• reduce the number of expedited shipments and rush orders	4.26	0.82
• reduce the amount of obsolete products	4.24	0.77
• increase the return on assets (ROA)	4.20	0.85
• increase capacity utilization	4.14	0.82
• better balance production and sourcing costs against transportation and safety stock costs	4.00	0.92
• drive revenue growth through clearer focus on high margin products	3.93	1.02
• increase sales and generate top line revenues	3.90	1.03

Note: n=88; 5-point Likert scales with 1: 'strongly disagree' and 5: 'strongly agree.'

asked respondents of our survey to indicate which metrics are most improved through S&OP. Their agreement was measured on 5-point Likert scales. The results, summarized in [Table 2](#), show the considerable expected benefits.

Although S&OP is conceptually easy to understand, as an alignment process it is very difficult to implement. Several of our interviewees stated that companies often try S&OP, but fail to reach the expected results. Therefore, we developed the S&OP maturity model—also referred to as S&OP implementation framework—presented in the next section.

5. A maturity model for aligning the organization

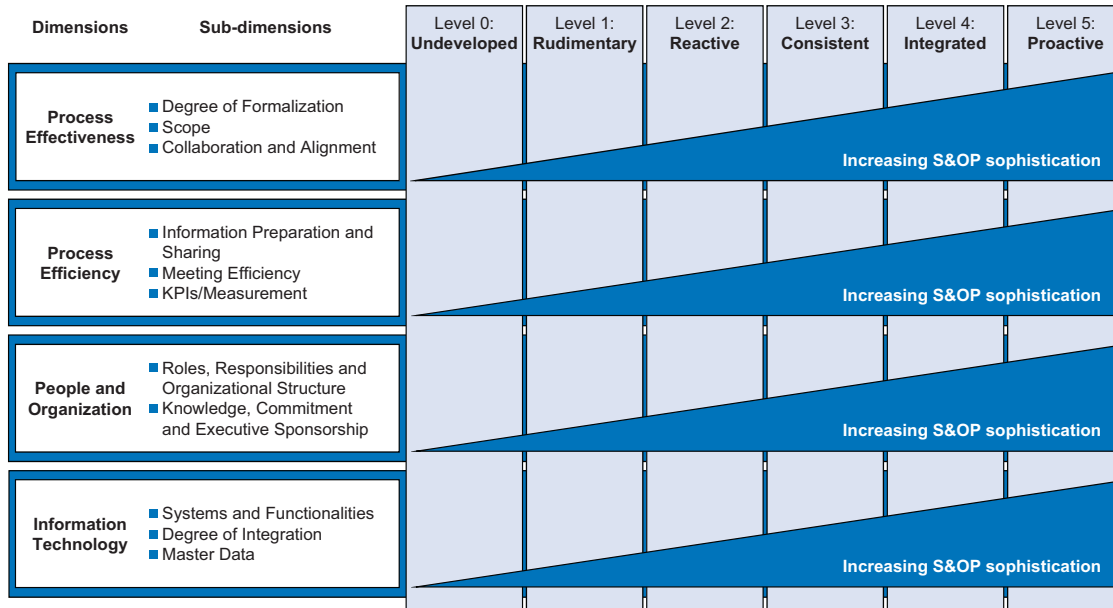
The few S&OP implementation frameworks or maturity models proposed in the literature vary in terms of S&OP process components, objectives, prioritization, and maturity levels. Moreover, they are not detailed enough to provide sufficient guidance for managers ([Thomé, Scarvada, Fernandez, &](#)

[Scarvada, 2012a](#)). Therefore, we synthesized these models and frameworks, enriched them with insights derived from our literature review, and used our interview data to develop a comprehensive S&OP maturity model ([Figure 3](#)).

We distinguish different levels of S&OP maturity. Level 0, 'Undeveloped,' is assigned to companies that have no planning processes in place and that try to fulfill incoming orders in a reactive manner. Level 1 is 'Rudimentary,' Level 2 'Reactive,' Level 3 'Consistent,' Level 4 'Integrated,' and Level 5 'Proactive.' Level 5 is the highest level that an organization can achieve within a foreseeable future. Up to maturity Level 4, process performance increases internally; Level 5 organizations extend their collaboration and alignment efforts throughout the supply chain.

Based on the coding of our interview data, four dimensions have been identified to evaluate firms' maturity levels: *Process Effectiveness*, *Process Efficiency*, *People and Organization*, and *Information Technology*. In an iterative process, we were able to derive characteristics and features of each

Figure 3. S&OP maturity model



of the six levels of advancement that define the maturity of the firm. Initial definitions were made by the authors based on our interview data and literature reviews. These were then discussed, refined, and validated in nine follow-up discussions with S&OP experienced practitioners. Table 3 provides the high-level description of the maturity model.

Process Effectiveness describes all characteristics and activities an S&OP process should include. As such, it pertains to ‘doing the right things’ and comprises three sub-dimensions: Degree of Formalization, Scope, and Collaboration and Alignment. The sub-dimension Degree of Formalization covers aspects that account for the importance of a high degree of S&OP formalization. Scope provides an overview of activities and information that should be performed and considered within S&OP. Collaboration and Alignment subsumes aspects related to information sharing and other alignment capabilities.

The second dimension, *Process Efficiency*, details aspects of how to integrate and align a set of plans with minimal effort. As such, it looks at ‘doing things right’ and comprises three sub-dimensions: Information Preparation and Sharing, Meeting Efficiency, and KPIs/Measurement. Information Preparation and Sharing describes redundancies in planning efforts that occur if information is not appropriately shared. Meeting Efficiency covers aspects regarding the scheduling and structuring of S&OP meetings. KPIs/Measurement defines characteristics that relate to the firm’s capability to measure S&OP performance and identifies potential indicators of why performance metrics are low or high.

Empowering all members of the cross-functional S&OP team, gaining top management support and sponsorship, and managing employees’ attitude toward S&OP are crucial elements of the S&OP process. We account for these aspects in the dimension *People and Organization*, with its two sub-dimensions: Roles, Responsibilities, and Organizational Structure and Knowledge, Commitment, and Executive Sponsorship. The former comprises aspects regarding responsibilities of S&OP team members, accountability issues, and the organizational implementation of S&OP. The latter describes peoples’ knowledge of and engagement in S&OP.

The dimension *Information Technology* comprises three sub-dimensions: Systems and Functionalities, Degree of Integration, and Master Data. Although information technology is considered of little importance in S&OP, our interviewees as well as some scholars have identified information technology as an S&OP enabler that is necessary to support the scale needed to achieve all of its benefits (Lapide, 2004; Wing & Perry, 2001). The sub-dimension Systems and Functionalities is the extent to which organizations employ demand- and supply-side planning systems and dedicated S&OP workbenches in addition to other transactional-oriented business systems, such as ERP. The sub-dimension Degree of Integration includes characteristics to assess the degree to which data can flow through different systems, departments, and companies, which is obviously one of the most important matters of concern to S&OP. To ensure that all the analyses mentioned above can be performed and—potentially even more important—that people trust the

Table 3. High-level description of the S&OP maturity model

	Level 0: Undeveloped	Level 1: Rudimentary	Level 2: Reactive	Level 3: Consistent	Level 4: Integrated	Level 5: Proactive
Process Effectiveness	<ul style="list-style-type: none"> • No formalized planning process • No scheduling of review meetings • No consideration of capacities • No promotions and price changes planned • No risk management in place • No product life cycles and new product introductions planned • No efforts made to align supply and demand-side plans 	<ul style="list-style-type: none"> • Slightly formalized planning process • Meetings not routinely scheduled • Not all SKUs/product families considered in planning process • Issues like promotions, price changes, capacities, risk management, new products, and life cycles planned but not considered in S&OP • Little attempts to develop a consensus supply and demand plan jointly and/or to consider information from others • Existence of multiple supply and demand plans 	<ul style="list-style-type: none"> • Moderately formalized planning processes and typically routinely scheduled meetings • Most SKUs/product families considered in planning process • Issues like promotions, price changes, capacities, risk management, new products, and life cycles insufficiently planned and considered • Demand-side provides a synchronized consensus demand plan so that supply-side organizations can generate a more or less aligned supply plan • No alignment with financial plans 	<ul style="list-style-type: none"> • Level 2 plus: • Very formalized planning processes • Routinely scheduled meetings • All SKUs/product families considered in planning process • Issues like promotions, price changes, capacities, risk management, new products, and life cycles internally sufficiently planned and considered • Demand- and supply-side organizations (without finance) jointly generate an aligned set of plans • Financial targets/plans primarily drive decisions, instead of being discussed and aligned together 	<ul style="list-style-type: none"> • Level 3 plus: • Internally completely formalized planning processes • Routinely scheduled and event-driven meetings • Issues like promotions, price changes, capacities, risk management, new products, and life cycles internally and externally sufficiently planned and considered • Demand- and supply-side organizations generate together with finance an aligned S&OP plan • No interactions with supply chain partners 	<ul style="list-style-type: none"> • Level 4 plus: • Planning process is formalized throughout the supply chain • Event-driven meetings • Issues like promotions, price changes, capacities, risk management, new products, and life cycles internally and externally entirely planned and considered • All relevant information is internally and externally shared to improve supply chain visibility • External supply chain partners participate in alignment process to ensure plan feasibility and cross-company profit maximizing decision making
Process Efficiency	<ul style="list-style-type: none"> • All planning is done manually • Information only partially available • Many redundancies • Frequent re-planning necessary • No planning meetings • No plan alignment • Planning efficiency and effectiveness not measured • No KPIs in place to measure planning performance • No performance tracking efforts made 	<ul style="list-style-type: none"> • Due to decentralized information storage, many redundancies in information preparation • High degree of friction losses in cross-departmental information flows • Meeting attendees not authorized to make decisions • Poor plan alignment makes frequent re-planning inevitable • Basic KPIs defined but only sporadically managed • KPIs not aligned across departments, with business strategies, and bonus schemes 	<ul style="list-style-type: none"> • Partially centralized information storage reduces redundant work in information preparation • Moderate friction losses in cross-departmental information flows • Due to rudimentary plan alignment, frequent re-planning required • Meeting attendees typically authorized to make decisions • Basic KPIs defined and regularly managed • Most KPIs harmonized across departments and partially aligned with bonus schemes • Some efforts of tracking performance 	<ul style="list-style-type: none"> • Level 2 plus: • Relevant information is automatically shared and prepared • Very little friction losses in cross-departmental information flows • Meetings are formalized and executed that way (e.g., authorized attendees) • Due to appropriate plan alignment, less frequent re-planning necessary • Planning effort fits partially to the organization's requirements • Structured mechanism for S&OP performance evaluation • Regular reporting and tracking of performance 	<ul style="list-style-type: none"> • Level 3 plus: • People receive only information they actually need • No friction losses in cross-departmental information flows • Meetings typically exception-focused and event-driven • Due to sufficient plan alignment, re-planning becomes very rare • Planning effort perfectly fits to the organization's requirements • Full alignment of KPIs across departments, with business strategy and bonus schemes • Internal S&OP benchmarks irregularly performed 	<ul style="list-style-type: none"> • Level 4 plus: • External participants are integrated via systems such as EDI to avoid redundant data entry • S&OP meetings take place event-driven only and on a virtual basis to avoid numerous journeys • Supply chain partners participate in alignment process to avoid rescheduling due to, for example, capacity restrictions of suppliers • KPIs also consider performance of supply chain partners and are aligned with payment modes • Internal and external S&OP benchmarks regularly performed

<p>People & Organization</p>	<ul style="list-style-type: none"> • No assignment of roles and responsibilities with regard to planning tasks and activities • No planning organization established • Employees do not understand the necessity of, and requirements for, S&OP • Insufficient planning know-how • No management commitment 	<ul style="list-style-type: none"> • Deficiencies in planning organization (no clear role descriptions, organization not aligned with business) • People are not held accountable for their plans and performance • Little skills, aptitude, and attitude of employees toward S&OP • Insufficient commitment and executive sponsorship 	<ul style="list-style-type: none"> • Roles and responsibilities clearly defined but not yet successfully implemented • No dedicated S&OP owner • People partially held accountable for their plans and performance • Insufficient knowledge to perform advanced S&OP activities • Moderate commitment and executive sponsorship 	<ul style="list-style-type: none"> • Level 2 plus: • New planning organization with dedicated S&OP process owner established • S&OP responsibilities clearly specified in job descriptions, people know and stick to them • Sufficient knowledge to perform advanced S&OP activities • Great commitment and executive sponsorship 	<ul style="list-style-type: none"> • Level 3 plus: • Planning organization entirely aligned with the business • Planning is agile and enables fast response to unexpected changes • Sufficient knowledge to perform additional planning related activities, such as risk management • Excellent commitment and executive sponsorship 	<ul style="list-style-type: none"> • Level 4 plus: • New organizational structure with dedicated S&OP process owner who coordinates planning efforts for the entire supply chain • Employees and top management highly committed and strive for continuous improvement • Top management of all partnering companies sponsor and participate in S&OP
<p>Information Technology</p>	<ul style="list-style-type: none"> • No planning systems • Heterogeneous spreadsheets existent and in use • Master data not (accurately) defined • No harmonization of master data throughout the organization 	<ul style="list-style-type: none"> • Isolated demand and supply planning systems with a very limited scope of functionalities implemented • No integration of demand and operations planning software • Planning systems do not have access to all relevant planning data • Inconsistent master data definitions • Master data not harmonized throughout the organization 	<ul style="list-style-type: none"> • Demand planning software and multi-facility production planning systems with more advanced functionalities such as statistical analyses to generate (sequentially) optimized plans employed • Information from other systems need to be manually entered or uploaded (no interfaces) • Planning systems have access to most relevant planning data • Most master data consistently defined but not entirely harmonized throughout the organization 	<ul style="list-style-type: none"> • Level 2 plus: • Multi-facility APS system in place • S&OP workbench and software that provides workflow support • All planning modules and tools are linked via interfaces to the underlying ERP-system and have access to all planning data • Plan adjustments are automatically incorporated in all modules • Master data consistently defined and harmonized throughout the organization 	<ul style="list-style-type: none"> • Level 3 plus: • Systems continuously keep track of plans and trigger automatically alerts in case of unexpected deviations • Software suggests resolution alternatives if required • Simultaneous/real-time feasibility analyses supported • One 'single truly integrated system' in place • Master data proactively managed internally but not externally 	<ul style="list-style-type: none"> • Level 4 plus: • Software supports CPFR, TPM and other visibility tools to integrate supply chain partners in IT infrastructure • IT systems are completely aligned throughout the supply chain • All relevant data (including capacities of third-party manufacturers, etc.) is available • Master data consistently defined and harmonized throughout the supply chain

Table 4. Self-assessed S&OP maturity of the sample firms

S&OP maturity dimension	Mean (M)	Standard Deviation (SD)
Process Effectiveness	1.89	1.07
Process Efficiency	1.95	1.05
People and Organization	2.11	1.01
Information Technology	1.89	1.15
Average across dimensions	1.96	1.07

Note: n=88; 5-point Likert scales with 1: 'strongly disagree' and 5: 'strongly agree.'

information, master data needs to be accurate. These characteristics are listed in the sub-dimension Master Data.

6. Empirical assessment

The questionnaire survey was used to get an assessment of the maturity level of firms' S&OP processes. Each maturity level dimension was measured on a 5-point Likert scale with multiple items. The mean scores and standard deviations of firms' S&OP performance in each of the dimensions were calculated and are tabulated below.

The evaluation scores of all dimensions are rather close to each other (Table 4). This is reasonable and indicates that improvements in one dimension require simultaneous optimizations in the others. Furthermore, there might be positive spillover effects from improvements in one dimension to improvements in others. Thus, firms should neither overestimate the potential of selected action steps nor underestimate the significance of a holistic view on all dimensions of S&OP.

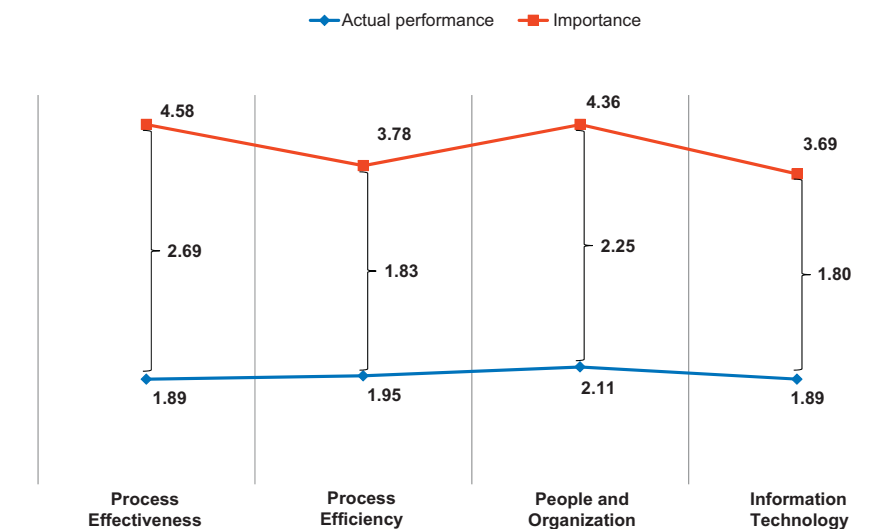
The subjects assessed S&OP maturity levels themselves. The highest maturity was in the dimension *People and Organization* with a mean of M=2.11. The mean score for *Process Efficiency* was M=1.95. Firms' S&OP maturity in the remaining two dimensions has been assessed equally well, both with mean values of M=1.89.

We calculated an average across all dimensions. It indicates that companies' current S&OP processes are close to 'Reactive'—that is, maturity Level 2 (M=1.96). This result is surprisingly low when considering the criticality of the topic.

The assessment of current S&OP processes reveals that significant improvements across all dimensions are inevitable in order to sustain competitiveness of firms. As not all dimensions are equally important to all organizations, however, we asked managers to indicate the importance of each dimension so that we could make more distinctive recommendations. The results are depicted in Figure 4.

We were not able to identify a statistical relationship between importance rankings and actual performance. Yet, the gap sizes between importance and actual performance imply that the dimensions

Figure 4. Comparison of actual performance and importance ratings



Note: n=88; 5-point Likert scales with 1: 'strongly disagree' and 5: 'strongly agree.'

Process Effectiveness and *People and Organization* should be prioritized when embarking on single improvement initiatives due to financial and/or time constraints. However, with regard to the identified interdependencies among all dimensions, in the long run, firms should ensure a rather balanced performance in all dimensions.

As not all organizations necessarily need a Level 5 S&OP process, each firm must decide on the basis of its own planning requirements (e.g., number of suppliers, customers, SKUs, demand patterns) the level of S&OP maturity it desires. A firm that operates only one production facility that purchases its materials from a small group of suppliers and sells them to a small group of customers at a rather constant rate does not necessarily require and benefit from IT systems that are integrated throughout the supply chain, enable real-time data exchange, and possess complex simulation features. Therefore, managers need to carefully balance incremental and investment costs against marginal benefits of greater S&OP maturity when deciding on target levels.

7. What happened at Geistlich Pharma?

When the cross-functional S&OP process was introduced at Geistlich Pharma, it was seen by most employees more as a compulsory exercise than a means of competitive advantage for the firm. Therefore, an ongoing dialogue between the S&OP project manager (Head of Supply Chain Management) and all stakeholders was needed to respond to criticisms and explain the benefits of S&OP. Moreover, much persuasive work was necessary when Geistlich Pharma set up a series of rituals for all employees. In a monthly cycle, Sales, Marketing, Production, and R&D convened with the Executive Committee for a 1-hour S&OP meeting. Slowly, the functional departments recognized the value of the big picture.

In the cross-functional S&OP process, a common and rich set of data was used to uncover inconsistencies in the local targets and plans, and was made available to everybody, which led to a redefinition of priorities. Common and absolutely correct data compiled in a central database ('bullet-proofed') were considered critical; otherwise, people involved in the project would have lost trust and discarded the project right away. Geistlich Pharma began to collect, clean up, and consolidate an enormous quantity of complex data, which is still continuously updated and checked. To recognize patterns and unearth correlations, Geistlich Pharma

considered determination and diligence to be of great help.

At Geistlich Pharma, very little IT-technology was used to achieve the transformation. The aim was to strike a pragmatic balance between actionability and data precision. For Geistlich Pharma, S&OP is not bookkeeping. It has grey areas, and this blurring within S&OP makes Geistlich Pharma more predictable and manageable. That said, the data quality has improved steadily within the departments.

The big picture shared by all has had other unexpected advantages. It has become easier to arrive at consensus on cost-efficient actions. In terms of communication, there are no more tensions over who should be asking or who should be informing. Since all departments are embedded in the processes and use the same terminology, there are fewer misunderstandings among functions. The cross-functional awareness has even deepened local expertise. Salespeople, for example, now grasp how production processes work and are thus more competent and self-confident in their dealings with customers.

The monthly reconciliation of supply and demand is high on the agenda. The S&OP matrix is also used for budgeting and medium-term planning. In this way, S&OP has become a de facto early warning system for potential supply or current-year target shortages. For Geistlich Pharma, S&OP makes arguments which are normally tense and emotional more objective—in both boom and bust years.

The 'Rolling Forecast' is a monthly-updated sales plan of the next 18 months. With this, spikes in production are anticipated and responded to in time, capacity planning is undertaken within predefined tolerance ranges, and the production is smoothed out. Accordingly, the forward-looking plan stabilizes workloads and utilization.

As a result, for all of the departments in Geistlich Pharma, S&OP has made the business more comprehensible and manageable. Sensitivity analysis, or scenarios like the collapse of a market, can be simulated faster with existing data. Likewise, data that had taken 2 or 3 weeks to gather before S&OP now requires only a few minutes. Since production is planned strictly according to market demand, S&OP also minimizes the costs of carrying and scrapping inventory.

Over and over again it became obvious that the most critical success factor for overcoming the initial resistance, sharing the necessary information across departmental borders, maintaining a high speed in the implementation of the S&OP process, achieving process compliance, and increasing meeting attendance was leader endorsement.

The strong belief of the CEO in S&OP and his insistence on making the project successful proved invaluable.

8. Managerial implications

From our case study, the literature review, the expert interviews, and the survey, we can deduce a number of implications and recommendations for corporate practice. First and foremost, S&OP is an approach that if properly developed and implemented can help firms to successfully align organizational plans (demand-side, supply-side, and financial), avoid costly mismatches of supply and demand, and satisfy customers through better service levels. Although the process is not new, today's business environment demands an ever-increasing ability to respond immediately and holistically to market volatilities. Therefore, managers should consider introducing or improving S&OP capabilities if they hope to achieve and sustain a competitive advantage.

Second, our maturity model provides a detailed map of what firms need to improve along the four dimensions (*Process Effectiveness, Process Efficiency, People and Organization, Information Technology*) in order to progress from a low level to a high level of S&OP proficiency. It also allows the top management of firms to judge S&OP performance, set targets, and recommend activities in order to reach a target maturity level.

Third, goal alignment through S&OP is still rudimentary in many organizations, so there is ample room for improvement as well as potential for a firm to distinguish itself from competition. Therefore, we urge and expect top managers to emphasize the importance of a well-implemented S&OP process and to take the appropriate steps to balance demand and supply. However, firms should not overestimate the potential of selected action steps but instead sustain a holistic view on, and balance performance of, all dimensions of S&OP.

Fourth, our maturity model can serve as a benchmark for the assessment of S&OP advancement across firms or over time. As such, on the one hand, it fosters continuous improvement; on the other hand, it can be used to explain differences in performance among firms.

Fifth, the success of S&OP launches shows that single metrics do not control operational performance. S&OP manages the company by matching operational and strategic data (e.g., financial resources, capacity investments, inventories, supply, demand). For example, inventory levels lose their traditional strategic importance because they are the consequences of, not the levers of, corporate

planning. The same principle applies to customer service, which is a gauge to be monitored, but no longer a controlling lever. The process is the control.

Sixth, the proper management of 'soft issues' is critical during and after S&OP implementation to increase the chances of success. Like any structural organizational change, all stakeholders must participate in it. Each has to understand the functionality and significance of the process, and should be appropriately trained with regard to the new responsibilities and tasks. If nothing else, S&OP improves the understanding and communication among departments.

Seventh, depending on current S&OP advancement levels and targets as well as the organization's size, setup, and culture, the consultation of a change agent is recommended throughout the improvement project in order to overcome employees' resistance to change, to fight silo mentality, and to educate top management. This can be an inside or outside change/S&OP expert who brings tangible benefits to the implementation project.

Finally, managers at the case study firm and the experts insist that S&OP is an ongoing journey. This includes regular feedback sessions at the end of S&OP meetings, which is particularly effective in early implementation phases; once the process has been established and each of the stakeholders understands the consequences of decisions for all business fields, the 'drive for improvement' should motivate the organization to challenge the underlying processes (e.g., Why do we need 10 days of inventory to give 95% customer service level?). That said, S&OP must establish itself as a function within a company—not merely as a temporary project with a deadline.

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