Cross-Functional Alignment for Sales and Operations Planning in a Cement Company in Indonesia

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Abstract. This paper aims to propose a conceptual framework of the Sales and Operations Planning (S&OP) process in a cement company in Indonesia. The company encountered several obstacles in their S&OP process, including asymmetric data information for planning purposes, conflicts between supply and demand planning, use of a manual spreadsheet to consolidate the supply planning, and integrating 2 (two) Enterprise Resource Planning (ERP) systems. A literature study regarding S&OP and its several aspects are performed parallels with a case study method to explore S&OP implementation in the company. The research strategy performed using focus group discussion with S&OP actors, observation on the meeting activities, and interviews with the key person in the selected functional area. The authors propose a conceptual framework of the S&OP process to resolve the problems adapted to company conditions. This paper's contribution is to provide an overview of S&OP implementation and its problem in the enterprise-level to provide a better understanding for practitioners in other industries and also academic performers.

1. Introduction
An Indonesian cement manufacturing company, called "the company", operates 5 (five) business brands with total production capacity of more than 50 metric tons per year. It has several integrated plants, packaging plants, distribution centers, and supply chain infrastructures to load and unload facilities for its product. Proper coordination across functions in the company is essential to compete in the market. It starts by planning the demand, running the production, maintaining production capacity, and making timely deliveries to customers. The company has embarked upon a roadmap to improve its capabilities adapts to the changes in customer behavior and information technology disrupting the industry. The company has plans to set mid-term planning initiatives to align the long term planning targets and short term operational plans. The mid-term planning initiative is sales & operations planning or better known as S&OP. The S&OP is a business process for balancing supply and demand on an ongoing basis. It is a cross-functional integration of marketing, new product introduction, sales, distribution, and production into a single plan and usually involves aggregate volume analysis, such as the product family [1].

Sales and Operations Planning, as recorded in the 13th edition of the APICS Dictionary [2] is defined as the process of developing tactical plans that help the company's leader direct the business strategies to achieve sustainable competitive advantage. S&OP integrates marketing plans for existing products and new product introductions with the management of the supply chain. S&OP supports the integration of supply chains between internal and external companies [3]. S&OP is also named aggregate planning, which is the process of determining its capacity planning, production, sub-contracts, inventory, stock
out, and price in a period. Aggregate planning solves a problem at the aggregate level, not at the stockkeeping unit (SKU) level [4]. S&OP is a coordination process across functions to reach a consensus on tactical plans in the company, representing the functions of marketing, sales, production, and distribution. The functions involved in the S&OP have a conflict of interest, sales function (marketing and sales) required a high volume of sales and customer service excellence.

In contrast, the operational functions of production and distribution required operational efficiency. S&OP is also called aggregate planning, which is medium-term planning. The planning is still a rough level both at the time level (usually monthly) and at the product level, such as product family [5]. Figure 1 describes the alignment of the various plans, by vertical and horizontal.

Before the year 2018, the company has run the planning process, but it does not refer to the correct S&OP process. A year later, the company started implementing the S&OP process based on the best practice framework for the manufacturing industry to enhance S&OP capability and its collaboration across functions. When performing the S&OP process, the company faces several problems in the S&OP process, including demand planning that is not aligned with supply planning. There is no data integration between the ERP system and data planning, distortion of information regarding data requests to be followed, inventory visibilities, production capacity, and distribution capability. All the data have to be consolidated by a supply planning officer using manual spreadsheet tools, and it might bring to data entry error or wrong calculation on the numbers. Another challenge is that there are 2 (two) ERP systems to integrate the process in S&OP after the company acquired a competitor in the year 2019. Enterprise Resource Planning (ERP) is a framework that defines, standardizes, and organizes business processes, to plans and controls the company's internal resources to gain external benefits [2]. ERP provides a transaction tracking facility, and also provide supply chain information visibility. The real time information that helps supply chain to enrich the quality of operational decision making. ERP shows what is happening in the organization, while supply chain management (SCM) decides what should be done [4].

This paper aims to explore the current S&OP process, investigate some aspects related to the cross-functional alignment problem, and propose a conceptual S&OP process to reduce the S&OP obstacles in the company.

![Figure 1. S&OP alignment process [6].](image-url)
2. Methodology
This section describes how the authors design a research approach through a case study combined with a literature review. The case study's first method begins with a focus group discussion (FGD) that involves representatives from each S&OP function in the company. The aim is to get an initial picture of the current S&OP and identify the obstacles that often occur. In the FGD, employees from cross-functional representatives are gathered into a discussion. They are asked for the outline of the S&OP stage, what are the stages, describe their functions in each of the S&OP stages, what data to be offered, the schedule, and the output of each stage. They also explained about the problems that always arise during the S&OP cycle.

The second method is the interview, the aims to obtain a deep understanding of S&OP. The author conducted interviews with some employees who were involved in the S&OP. The interviewees are the company's employees, who represent their function area involved in the S&OP process. The open-ended interview questions have been prepared and mapped to a corresponding topic, and each interviewee is asked to explain their answer. The questions can be revised to fit with the interviewee's background and knowledge of the S&OP. The authors organized the interview as follows (i) prepare interview protocol as a guide, it includes interviewees lists and their job description, and the knowledge of the S&OP; (ii) invite the participant to the interview schedule using email calendar; (iii) collect the result and transcribe it into a transcript document; (iv) analyze the results. The author requests the interviewee to be contacted again if anything to be clarified. The interview process is held by video conference, and it is recorded.

The third method is observation. The author attended the serial S&OP meeting to observe how the S&OP meeting works. The aim is to analyze how the meeting is held, the objective, the participants, who lead the meeting, any minutes of the meeting created, and do they deliver the minutes of meeting to all participants.

A parallel literature study is conducted to determine the definitions and steps in S&OP, and some aspects of S&OP that affect the implementation of cross-functional S&OP in an organization. Using the combination of case study and literature study, the authors can understand the current situation compared with theory. The S&OP process is an activity where different strategic functions meet together to develop production plans to serve market needs economically, supporting the company's strategic and financial plans [7]. Generally, there are five steps of the S&OP process based on authors [5], among other data gathering, demand planning, supply planning, pre-S&OP meeting, and executive S&OP meeting. Data gathering is a process to collect data, such as forecasting. Demand planning is a process to review the forecast data and make some updates. Supply planning is a process to review and calculate capacity planning and update it based on the maximum capacity constraint. The pre-S&OP meeting is a meeting that involves related functions, among them sales and marketing, production, planning, finance, plant manager, and others. The executive meeting is a meeting that involves executive management monthly.

Meanwhile, according to another author, S&OP is a process that consists of several meeting series [8]. The first meeting is pre-S&OP, at the demand planning meeting stage, demand planning team who are marketing and sales collect statistical forecasts, customer promotion plans, and new product introduction to show the most realistic sales plans based on unconstraint demand. The unconstraint sales plans are then given to the supply and resource planning team. This team will analyze the unconstraint demand compares with production plans, inventory level, and production capacity. What-if-analysis to be performed to show several scenarios in minimizing demand shortages if there are capacity constraints. The output of this meeting is a plan for operations and resources. Then a financial integration meeting is held to reconcile operational plans with financial targets. The meeting's output is an analysis of financial targets (revenue, cost, and profit margin), business targets, and the agreed customer service level. The second is the S&OP meeting, and it is usually held every month, involving all related functions to review and reconcile supply plans and demand plans. The third is the post-S&OP meeting, in which the critical thing in this step is related to authorizing, executing, and monitoring the agreed plans. After meeting, the leader communicates the consensus plan to all team members as a blueprint until the next month’s S&OP cycle. Monitoring operational progress on initial plans is essential. The
following KPIs include forecast accuracy, profitability variants, and revenue targets, and service level customers.

Some S&OP aspects that affect to cross-functional alignment were found in some research. Firstly an S&OP maturity model mentioned 3 (three) categories, meeting, process, and technology [9]. The second S&OP maturity model arose 5 (five) categories, among other meetings and collaboration, organization, information technology, measurement, and integration plan [10]. The third is the S&OP coordination framework formed with 6 (six) mechanisms amongst organizations, process, measurement, data and tools, leadership and culture, and performance management [11]. There are five aspects of S&OP to be considered as a starting point of the research amongst organizations, information technology support, meeting and collaboration, measurement, and leadership. The organization is used to define the person and functions involved in the S&OP process that provides a formal structure of an organization, define roles and responsibilities, and define a centralized or decentralized organization. Information technology support is used to support the S&OP process with appropriate IT solutions that construct single truth of data, integrate data in realtime, and support effective decision making. Meetings and collaboration are used to evaluate the effectiveness of human components in S&OP, and it describes the participation at a formal meeting and how to coordinate among them. Measurement to ensure company targets' achievement, among other financial performance, production performance, and operational performance. Leadership is essential to create leadership for the success of the S&OP process that facilitates commitment, empowerment, constructive engagement, trust, top management support, and capability in dealing with conflict.

Along with the company's increasing capacity and the complexity of business processes, no doubt, the need for technology support becomes unavoidable. The S&OP requires the support of IT, divided into three types of software applications [9], demand-side planning, supply-side planning, S&OP workbench. Demand-side planning is the system to handle the improvement of the demand plan and unconstrained baseline forecast plan used as demand input in the S&OP process. Supply-side planning is the system to supports the improvement of a supply plan that is used as a supply input in the S&OP process by bringing inventory, production, and procurement projections following the initial unconstraining demand forecast. This plan will produce a constrained demand when supply capacity is not sufficient to meet customer needs. S&OP workbench is the system that supports the provision of information needed to be shared during cross-functional S&OP meetings. The first is to offer a dashboard that can display the supply plan overview compared to unconstrained demand, and the second is to provide information on how well the S&OP process is running. Figure 2 shows how the three software above should be integrated with other business applications.

![Integrated Supply-Demand Planning Technology Architecture](image)

**Figure 2.** Technology architecture of S&OP [9]
S&OP need technology support, but at the early stages of implementation, understanding business processes itself is more important than the use of technology [9,10]. Tools such as spreadsheets can be used in the early phases of implementation, so the focus is more on building business processes appropriately. Furthermore, when the company moves forward to advanced S&OP, technology support is significant. In this case, the company can adopt S&OP software and optimization to share information with all company members. The company is currently in an initiative to adopt ERP-based technology solutions to support their S&OP process.

3. Case Study

Based on the case study's collected information, the authors describe it into two sections, the S&OP current condition, and the expected condition after a conceptual model developed.

3.1. The company S&OP current process

The company runs the S&OP stages every month, which consists of 4 stages including tactical demand, tactical supply, pre-S&OP meeting, and executive S&OP meeting. The first stage is the tactical demand. This process begins with the demand planner's collection of demand data, followed by coordination between marketing and sales staff to produce an unconstrained demand plan and how much revenue projections will be received. Further improvements and adjustments are made with additional data, including historical shipping data, promotional data, market prices, new product plans, and competitor activities. The sales unit in each region will detail the national demand plan from the marketing unit at the product stock-keeping unit level and district level. This process is started in the first week of the cycle period. The second stage is tactical supply. This process is to review unconstrained demand plans, supply constraints amongst production capacity, stock, storage capacity, transportation capacity, maintenance schedule, aligned with supply chain strategies and operational strategies. The cross-functional teams are involved during this stage, including distribution, production, and supply chain infrastructure. The results are a consensus demand & supply constraint, inventory projection, and revenue projection. This process is carried out in the second week of the cycle period.

The third stage is the pre-S&OP meeting. This process is meeting activity to balance the demand plan and supply plan capability and to estimate the projected financial plan amongst cost, revenue, and margin. The meeting is attended by demand planners and supply planners who represent the functional area of marketing, sales, distribution, production, supply chain infrastructure, and finance. This process is carried out in the third week of the cycle period. The outputs are agreement on volume, sales figure, and projection financial figure. Moreover, to find if any gap between the annual operating plan (AOP) and proposed supply plans, any issues will be brought to the top management meeting session.

The fourth is the most crucial meeting called the executive S&OP meeting. This process is meeting activity to solve some issues during the previous process, direct company strategies, and decide the final consensus demand & supply plans by top management level. The participants are directors, senior management level, and some key persons from demand and supply planners. The results will be followed up and to be executed at the operational level. This process is carried out in the fourth week of the cycle period.

The company's top management has been very supportive of the current S&OP process, and they are very enthusiastic about being directly engaged in the process, especially at the S&OP executive meeting. Regular meetings have been held in each S&OP cycle, lead by an S&OP leader appointed from the distribution planning function. The results of the meeting and arising issues have been recorded and sent to all meeting participants. Team meetings are also held outside of regular meetings to ensure that the operational team has carried out the planning. Besides, other communication media are also used to communicate more intensely through online applications and e-mail.

The current process has begun to run well following the stages. However, continuous improvement must be carried out, including establishing standardization and integration of data, agreement from all
3.2. Expected S&OP process in the company

Based on the case study of the current process and some obstacles that always happen, the authors drafted a conceptual framework of S&OP for the new solution. This proposed conceptual framework is modified not only the process but also integrates technology support. It is expected to improve the S&OP process and company target, concerning the five steps, among other data gathering, demand planning, supply planning, S&OP meeting, and executive S&OP meeting.

The first step is data gathering. This process will enable forecast data to be uploaded to the system, combined with data master integration from the ERP system and historical data of sales order and delivery shipment. In terms of integration, the data transferred from ERP to the planning system at a scheduled time. The second step is demand planning. This process is a review activity of demand plans based on the uploaded data. The system will propose the demand plans at a specific planning level based on the preconfigured ratio calculation at three months time horizon. Marketing and sales input will be consolidated to generate consensus demand plans. It is the first-week activity in the S&OP calendar.

The third step is supply planning, and this process is a review activity of supply plan capability based on the consensus demand plans. The system will propose supply sourcing plans at the lowest cost or the most optimum profitability considering some constraints, among them production capacity, production cost, transportation cost, inventory, storage capacity, and others. It is the second-week activity in the S&OP calendar. The fourth step is the S&OP meeting. This process started by reviewing the demand plans and supply plans based on several scenarios that have been created, balancing the demand and supply and highlight if any issues arise. Financial teams also involve reviewing cost and revenue projection. The constrained plan will be finalized, and any unresolved issues will be released to the executive S&OP meeting. It is the third-week activity in the S&OP calendar. The fifth step is the executive S&OP meeting; the meeting with executive management will follow up any unresolved issues during the previous meeting. Executive management approves the final S&OP plan based on all considerations and recommendations proposed by the system and participants. It is the last activity in the S&OP calendar, flexible to change according to the management schedule.

The availability of a software platform that can be accessed together with related functions will provide extra benefits for the similarity and data accuracy so that a single data of truth is realized. This software can be developed by the company's internal team or S&OP applications that are available in the market that can be interconnected with ERP. The S&OP is a continuous process and interrelated, so it requires commitment from all related functions and top management to carry out their duties consistently. Any delay response from one party will hamper other party tasks in the next process and impacts to the whole S&OP cycle.

4. Results and Discussions

Based on the collected information from a literature review and the case study, there is a difference in the S&OP process. There are four steps in the company's S&OP cycle amongst tactical demand, tactical supply, pre-S&OP meeting, and executive S&OP meeting. Compared with the literature, there are five steps amongst data gathering, demand planning, supply planning, pre-S&OP meeting, and executive S&OP meeting. In the company, the data gathering process is a part of the tactical demand and tactical supply process. Table 1 describes the summary of the S&OP process and its activities in the company.
Table 1. S&OP stages and activities in the company.

| Process          | Tactical Demand                  | Tactical Supply                                                   | Pre S&OP Meeting                           | Executive S&OP Meeting                  |
|------------------|----------------------------------|------------------------------------------------------------------|--------------------------------------------|------------------------------------------|
| Function         | Marketing Sales                  | Production Distribution SCM Infrastructure                      | Marketing & Sales Production Distribution SCM Infrastructure Finance | Directors Senior Vice Presidents General Managers Senior Managers |
| Activity         | Collecting demand plans          | Review demand plans and supply constraints (production capacity, storage capacity, stock, transportation capacity), maintenance schedule, production cost, transportation cost. | Balancing demand & supply, projecting financial figure (revenue, cost, margin), creating scenario planning. | Approval of demand & supply plans, resolving issues, directing strategies |
| Data source      | Annual Operating Plan, market share data, transaction history (ERP), marketing input, sales input | Unconstrained demand plan data master, production capacity, storage capacity, maintenance schedule, stock balance | Demand, and supply plan, proposed scenarios | Consensus demand & supply plan (constrained), scenario proposal |
| Output           | Consensus demand plan (unconstrained) | Supply planning, supply constraints | Consensus demand & supply plan (constrained) | Final demand and supply plan, initiative strategies |
| Schedule & Duration | Week 1 3-5 days data preparation 2-3 hours meeting | Week 2 3-5 days data preparation 2-3 hours meeting | Week 3 2-3 hours meeting | Week 4 2-3 hours meeting |

The company has a positive value, they already run the business in the ERP system, even though the data has not been fully utilized for planning purposes. Data gathering can be integrated from ERP data, but the challenge is how to integrate two different ERP to single S&OP system, the data structure has to be standardized. Along with the growth of the company in the future, it should not run S&OP only rely on manual tools, and asynchronous data owned by related functions will lead to an inaccurate result, potentially inaccurate decision making.

The company should continuously strive to enhance collaboration and develop new KPI standards. KPIs that have the potential to cause internal conflicts will be adjusted to support each other, with the hope that there will be no more conflicts caused by contradictory targets. To ensure all functions can receive the updated data in realtime, the company needs to provide an information technology-based collaboration system. As an alternative, using an online shared folder is also one of the best choices shortly. Support from top management in the current S&OP process can be followed up by submitting proposals to realize the initiative.

After studying the literature and exploring the information and experience from the case study, the author designed an S&OP process that might be appropriate for the company, especially in terms of supporting the cross-functional alignment and integration process. Although the proposed S&OP process in Figure 3 has not been validated, some advantages are expected to be obtained by the company. It provides collaborative tools to manage the S&OP process across different functional areas. It
integrates two ERP systems with the S&OP system, and automated data collection shall reduce manual process on data gathering step, deliver single truth of planning data, both supply planning, and demand planning will use the same data. A centralized organization of sales, marketing, distribution, and supply chain infrastructure made coordination and collaboration easier. This paper aims to describe the ongoing S&OP process, find the problems, and propose necessary improvements according to the literature guidelines.

![Proposed conceptual S&OP framework](image)

**Figure 3.** Proposed conceptual S&OP framework.

5. **Conclusions**

The IT support aspect plays a significant role in providing automation in the data collection process. Providing applications for all functions involved in the S&OP can use a single system and share the same data in a transparent and real-time manner, thus accelerating decision making. In addition, the company must define and measure the key performance indicator (KPI) to all related functions. The KPI should be defined as consolidated KPI among them, to gain the company targets, not only functional area target. It would be an exciting topic to explore KPI measurement in the S&OP process.

The framework proposed in this research still requires validation from external parties if it is implemented to other companies so that further researchers can add external validation options to their research. For the company's scope, developing a new S&OP process integration concept with procurement and related parties outside the company, such as vendors and customers, will be a further challenge. Moreover, the S&OP maturity model should be measured after implementation to understand how well the company’s S&OP has improved.

6. **References**

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