

Enlightening S&OP projects through the lens of contingency theory

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Abstract: Sales and Operations Planning (S&OP) projects are affected by the contexts where they are applied and there is a growing need by academics and practitioners to figure out the role of specific contingency factors. This research aims to explore different contexts through multiple case studies, grounding the research on the lens of contingency theory. The contingency factors proposed by the literature and considered here are industry, supply chain complexity, firm size, hierarchical planning framework and organizational characteristics. This research outlines the way the contingency factors set the current and desired stage of S&OP implementation, by considering the maturity model in terms of meeting and collaboration, organization, measurements, information technology and S&OP plan integration. Indeed, not all the companies need to reach the highest level of maturity in each S&OP dimension, but the proper one according to the context where they compete. From the academic viewpoint, this research offers new advances in the field of Operations Management Practice Contingency Research (OM PCR). From the organizational perspective, this study offers a guide for the practitioners to decide the appropriate maturity stage, for each dimension of S&OP, to maximize the effectiveness of the S&OP implementation.

Keywords: S&OP; Maturity model; Contingency theory; Operations Management Practice Contingency Research

1. Introduction

The nowadays challenges in the markets have led to higher product complexity, higher demand complexity, higher supply-related complexity (Ivert et al. 2015, Cigolini et al. 2022b), outstanding relevance of circular economy (Amico et al. 2023d, Catellani et al. 2023) and supply chain risk and resilience (Amico et al. 2022a). A possible solution is the adoption of S&OP, see Feng et al. 2008, which is a tactical process used to respond to the uncertainty of the context (Thomé et al. 2012a; Grimson et al. 2007, Rossi et al. 2017). The concept of S&OP has evolved from aggregated production planning in the early 1950, then into manufacturing resource planning (or MRP II), in the middle of 1980, to the current definition of business process for the alignment of supply and demand (Thomé et al. 2012b, Cigolini et al. 2022a). As reported by Kristensen et al. 2018, the basic set-up of S&OP does not fit for all the contexts, because specific contingency factors could affect it in different ways. For this reason, the scope of this research is to add insights on how enlightening S&OP projects set the current and desired stage of implementation for the S&OP process, in function of the contingency factors.

2. Literature review

The systematic literature search protocol is the research methodology used both for the theoretical lens (contingency theory) and the empirical context (S&OP). To review the literature, the methodology used is the conceptual review, to identify a golden thread for the researched area. For the theoretical lens and empirical context, the data source is “Scopus” database since contains the relevant research for Management and

Industrial Engineering. The keywords used for the theoretical lens were: *Contingen* Theor** AND *Operation* Management* OR *OM*. From 36 documents found, plus 2 seminal books, at the end 28 documents were eligible for full text screening (10 documents were excluded since out of scope, referring to contingency theory as theoretical lens in OM). The keywords used for the search, for the empirical context, were: *sale* and operation* plan** OR *sale* & operation* plan** OR *S&OP*. These keywords have been used by several authors, including Thomé et al. 2012a, 2012b and Tuomikangas et al. 2014. From the literature search, 175 documents were identified starting from the year 2001, due to the seminal paper by Olhager et al. 2001, and 71 papers, at the end, were resulted eligible (88 documents were excluded because out of scope referring to S&OP, 16 documents were excluded since the full paper access was not allowable).

3. Research framework

In the field of Operations Management (OM), there is a growing interest in the fit among contextual factors and the OM practice, to improve the related effectiveness. Even for the S&OP practice there is yet a limited number of papers which study the impact of the context on its set-up. From the knowledge gaps identified, the following research question is introduced:

RQ1. How do contingency factors set the current and desired maturity stage of S&OP practice?

Answering the research question, the research methodology more adapted to the question “how”, as reported by Yin, 2003, is the multi-case study methodology. As reported in Cigolini et al. 2023, to give robustness to the research for S&OP in OM PCR, the multiple case study

could be an effective research methodology to adopt. The selection of the cases is grounded on the criteria suggested by Eisenhardt, 1989 to limit the extraneous variation and sharpen the external validity. In this study the extraneous variation is limited by the choice of big size company (to limit the variation given by the differences in the dimension), in four different industries (to limit the environmental variation given by the industry, see Amico et al. 2022b). In addition, the choice of big size companies is also given by the fact that, as reported by Grimson et al. 2007, the large companies have a S&OP process, tendentially, more sophisticated than smaller. Furthermore, all the selected case studies have a mature S&OP process implemented, with the aim to have powerful insights from the case study analyzed, as suggested by Yin, 2003. The unit of analysis, in this research, is the organization with a comprehensive approach. For the data collection, to follow the criteria of construct validity, it has been used multiple sources of evidence: interviews, official web documents, observations. For the interviews, semi-standardize interviews were played out, selecting, before-hand, who interviewing. After the interview, for each case was conducted an analysis of the correlations among contingency factors and S&OP design, and then played out a cross-case analysis.

3.1 Contingency theory

The contingency theory (CT), developed in 1960s, affirms that the maximum of performance is the result of the appropriate fit among the organization characteristics and the contingency factors (Donaldson 1995, 2001). There are several CTs in function of the characteristic of the organization analyzed: structural CT, leadership CT, human resource management CT and strategic decision-making process CT. The contingency theory of the organization, developed since 1960s, is a result of fit between the organization and the contingency factors (Donaldson 1995, 2001). This is different from what the universal theories of organization hold, namely that the maximum level of performance is reachable from “one best way” that is the maximum level of an organizational characteristics (Donaldson 2001, Pero et al. 2016). In the field of Operations Management (OM), there is a growing need to analyze the effects of the contextual factors to the effectiveness of the OM practices in the performance of organization. OM PCR is the part of the research in which these effects are analyzed, and the CT is one of the main theoretical lenses used (Walker et al. 2015).

3.2 The contingency factors

Tuomikangas et al. 2014 hold that not all the organizations can use the basic design of S&OP proposed in literature. This is aligned to the CT for which it is important to fit the design of the practice with the contingency factors. According to the literature, for S&OP the contingency factors pinpointed so far are: industry, firm size (large firms require more S&OP adoption) supply chain complexity (demand uncertainty, demand pattern, supply uncertainty), manufacturing strategies (make to stock vs make to order), manufacturing process (e.g. job shop vs continuous line process), hierarchical planning framework (integration

between tactical and operations plan), organizational characteristics (human, technology and organizational). (Olhager et al. 2001, Grimson et al. 2007, Thomé et al. 2014a, 2014b, Goh et al. 2015, Ivert et al. 2014a, 2014b, Noroozi et al. 2016, 2017, Kaipia et al. 2017, Kristensen et al. 2018).

3.3 S&OP maturity

Different maturity models have been proposed in literature (Grimson et al. 2007, Wagner et al. 2014, Pedroso et al. 2017), according to the type and number of dimensions (mechanisms) considered, and the type and number of evolvment stages. The role of these models is threefold: descriptive for the implementation of S&OP, prescriptive to understand the current and the following stage to reach, comparative to benchmark the maturity stage of the company with respect to the competitors (Danese et al. 2018). The maturity model proposed by Grimson et al. 2007 is deemed, in the academic literature, as a reference for the assessment of the S&OP maturity (Danese et al. 2018). It is based on five level of maturity and five dimensions, which include business and information processes. As Grimson et al. 2007 hold, the levels of improvement of S&OP are: stage one (no S&OP process), stage two (reactive S&OP), stage three (standard S&OP), stage four (advanced S&OP), stage five (pro-active S&OP). The dimensions analyzed for these stages are: meeting and collaboration, organization, measurements, information technology (see e.g., Amico et al. 2023a, 2023c, Amico et al. 2022c), S&OP plan integration. Meetings and collaboration are the result of the effectiveness of the human resources involved in the process. It includes the participants in the S&OP meeting, the degree of formalization of the meetings and regularity in the participation, the level of trust and commitment in the participation, the degree of cross-functionality (Grimson et al. 2007, Thomé et al. 2012a, Dreyer et al. 2018, Amico et al. 2023b). It starts from the stage 1, in which there is a silo culture, to the stage 5, in which event driven S&OP meetings are played out among the departments, with even the participation of top suppliers and customers. Organization is related to the definition of the corporate S&OP structure, the level of empowerment of the team for S&OP and executive participation, the definition of an agenda and steps to follow (Dreyer et al. 2018). The steps are mainly 5: data gathering, demand plan, supply plan, pre-meeting, and executive meeting (Wagner et al. 2014). It could be necessary the addition of a preliminary step at the beginning (event plans, Dreyer et al. 2018), and two further steps at the end of the process in case of a multinational company (global roll-up and global executive meeting, Seeling et al. 2021). From Grimson et al. 2007, the stage 1 is in the case of a total absence of S&OP organization, whereas in the maximum level there is a formal team in which the executives of the company participate. At this stage the S&OP is seen as a process in which alle the decisions lead to a higher level of profitability for the company. Information Technology is the dimension related to the information process and concerns systems and software used for S&OP, the degree of sharing and consolidation of information (Dreyer et al. 2018). For early

stages of S&OP, it is not so pivotal to have advanced Information Technology (IT) systems such as simulation tools, mathematical patterns, and Advanced Planning Systems (APSs, Grimson et al. 2007, Ivvert et al. 2010). It starts in the stage 1 with a missing consolidation of data among departments but just within the single departments. In the stage five, real time data are used and managed to respond faster to changes with the aim to raise the profitability of the company. S&OP Metrics includes measurement of S&OP effectiveness and efficiency. (Hulthén et al. 2016). In the stage one, Grimson et al. 2007 report that are not present sales and operations measurements but just those related to financial reporting. In the maximum stage of S&OP, the target of the process is focused on the maximization of the profit and, accordingly, all the measurements are correlated to the impact of the process to the profitability of the company. S&OP plan integration, for Grimson et al. 2007, is the result of the effectiveness of all the other dimensions of S&OP, to lead to the integration among the departments. In stage 1, there is not an S&OP process and the Operations department try to follow the demand, without any kind of information shared from other departments. Whereas in the maximum stage the output of S&OP is a seamless plan in which the profitability is the goal to reach.

4. Multi-case study

In this section, each case study is analyzed in terms of how the contingency factors affect the choice of the proper maturity (following the maturity model suggested by Grimson et al., 2007) to reach for the S&OP process. For this aim, for each case, we conducted an interview in which for the contingency factors, pinpointed in the literature, we asked how the company has implemented the S&OP properly.

4.1 Cimbali Group

Cimbali Group is the leader in the design and production of professional espresso machines, with a distribution network which cover 100 countries worldwide. The size of the company is high (around 700 people), and, before the S&OP implementation, a silo culture was predominant. Concerning the “meeting and collaboration” dimension, for the organizational characteristics, to have more legitimization of the process, Cimbali has reached the stage 3 of maturity with the participation of the executives in the S&OP meeting. For the demand uncertainty, some customer data is included in the S&OP discussion. So far it is missing the part related to the supplier data, to face with the supply uncertainty. About the “organization” dimension, the stage reached is between 4 and 5, with the presence of a S&OP team dedicated of 3 people. There is the participation in the process even by the General Director, giving more importance to the process of S&OP for the company (due to the characteristics of the organization). For the “measurements” dimension, the stage reached is 3 with the calculation and analysis of the trend of the sales forecast accuracy (to cope with the demand uncertainty). Concerning “information technology” dimension, the stage reached is 3 with the information centralized in the ERP, and the presence of

APS to support the operations planning (to face with demand and supply uncertainty). For “S&OP plan integration” dimension, the stage reached is the fourth with high integration among the plans from the departments, due the importance of S&OP in the organization.

4.2 Agtech Italy

Agtech Italy (the company’s name has been disguised) is a leading science-based “agtech” company belonging to a global company with 30.000 employees, in more than 90 countries. The characteristics of its industry, its size (300 employees solely in Italy) and the hierarchical planning network put forward the need for S&OP. The portfolio is composed of around 300 SKUs, with a demand affected the most by the seasonality, the weather conditions, the presence of Phyto-pathologies and regulatory rules. The dimension “meeting and collaboration” is between stage 3 and 4. To deal with the demand uncertainty, there is a tool where are gathered the sales forecast from the customers. Concerning the supply uncertainty, the data of top suppliers are integrated in the S&OP process. The dimension “organization” is in the stage 5 since S&OP, due the organizational characteristics of the company, is a crucial process for the company. There isn’t a dedicated team, but there is a responsible for each stage of the process to share the responsibility of the process to all the company departments. The dimension “measurements” is at stage 5, due the importance of the S&OP process in the organization. The measurements are done considering the implications of the decisions, in output from S&OP, on the company profitability. The “information and technology” dimension is at stage 4, to cope with the demand uncertainty, with a tool to support the S&OP process. The dimension “S&OP plan integration” is at the stage 5 since, for the organizational characteristics, all the departments are jointly fully engaged in the process (S&OP is viewed as a crucial business process for the profitability of the company).

4.3 Pumps Italy

Pumps Italy (the company’s name has been disguised) is a leading manufacturer of pumps, working jointly with its customers from the design to the delivery of tailored centrifugal pumps in relation to the specific needs of the customer (the manufacturing is engineering to order - ETO). S&OP has been implemented due to the need to have a tactical levelling of engineering and production workloads in a big size company (around 400 people). The dimension “meeting and collaboration” is at stage 3 with a one monthly meeting among the departments. Customers and suppliers don’t participate in the S&OP meeting, but the data are included in the discussion during the meeting (to face with the demand uncertainty and supply uncertainty). The dimension “organization” is at stage 3, since there isn’t a dedicated team, but the general manager is involved in the process (to legitimate the process, due to the organizational characteristics). The dimension “measurements” is between stage 2 and 3, since there isn’t a discussion during S&OP meeting of the sales forecast accuracy, but however there is the monitoring of this accuracy outside the S&OP process. About “information

and technology” there are tools to support the S&OP process (to cope with the demand and supply uncertainty). For the “S&OP plan integration” the stage is between 2 and 3, since there is more a top-down alignment (sales plan drives operation plan) than conversely.

4.4 LKQ Rhiag

LKQ Rhiag is the leading Business to Business (B2B) automotive aftermarket distributor in Italy and belongs to LKQ Corporation. In the latest years, the automotive aftermarket has become very competitive, and the demand uncertainty has triggered the S&OP implementation. About the dimension “meeting and collaboration”, the demand and supply uncertainties have required the stage 3 of maturity, at least with some of top suppliers and top customers data included in the process. For the organization, there is a formal, but non dedicated, S&OP team with a representative from each department (due to the organization characteristics). When it comes to measurements, the stage of maturity is 3, to cope with demand uncertainty (with high attention to the sales forecast accuracy) and supply uncertainty (monitoring the availability at supplier). For the dimension “information technology”, the high differentiation among the departments (organizational characteristics) has pushed to decide for a common space where collect all the inputs from the departments, the scheduling of the process, the results of the measurements, the procedures. Concerning the “S&OP plan integration”, the challenges in the context for Rhiag and, timely, the specific problems of stock-out and excess stock events (demand uncertainty), has required an integration among sales forecast plan and purchasing forecast plan.

5.Key findings

In this section, the results of this research are reported considering each dimension and each stage of maturity reached and desired, consistent with the model proposed by Grimson et al.,2007.

5.1 Meeting and collaboration

In all the cases the “meeting and collaboration” dimension is influenced by the contingency factors: demand and supply uncertainty. Among the four cases, Agtech has reached, so far, the most advanced stage of maturity, between stage three and four. This is because the level of demand and supply uncertainty is very high, due to the strong seasonality, the influence of weather conditions, the presence of Phyto-pathologies, the regulatory rules, the uncertainty in the supplying of raw materials. In fact, for the supply uncertainty, in Agtech the information from top suppliers is considered in the process. For the customer uncertainty, there is a tool where are gathered information from the customers. The stage is between stage 3-4 because there is not, so far, the participation of suppliers and customers in the S&OP meeting, which is the next part to reach. The other cases are all in the stage 3, playing out cross-integration among the departments and the integration with just some top suppliers and/or customers. Notably, for high demand variation and supply uncertainty,

in two cases is preferable to increase the frequency, up to organize ad hoc S&OP cycles in case of unexpected drop or picks in sales. The desired step, for the four cases, is the stage 4, due to the importance of getting to a predominant share of suppliers and customers in the S&OP run, motivated by demand and supply complexity in the context.

Table 1: effect on meeting and collaboration

Main contingency factors	HOW
<i>demand uncertainty</i>	<i>higher demand uncertainty leads to more integration and participation of the customers in the S&OP process, from the data collection to the customer participation with the sharing of real time data. To face unexpected events is preferable to run more frequently the S&OP process.</i>
<i>supply uncertainty</i>	<i>higher supply uncertainty leads to more integration and participation of the suppliers in the S&OP process, from the data collection to the supplier participation and the sharing of real time data. To face unexpected events is preferable to run more frequently the S&OP process.</i>

5.2 Organization

The organization is related to the definition of a S&OP structure, the level of empowerment of the team for S&OP and executive participation, the definition of an agenda and steps to follow (Dreyer et al. 2018). Even for the dimension “organization”, AgTech has reached the most maturity stage, particularly the maximum level for this dimension, since S&OP is seen a crucial means to discuss and review the sales forecast. There is not a dedicated team, but, as reported previously, there is a responsible for each stage of the process to share the responsibility of the process throughout the company. The presence of a formal S&OP team is foreseen just in the case of Cimbali, with the presence of a S&OP team dedicated of three people, to raise up the importance of the process within the company. The executives in all the cases are involved, CEO/General Managers attend the meetings in three cases with the aim to legitimate more the process throughout the company. For all the cases the S&OP process is underneath the Supply Chain department, in three cases the Finance Department is involved to include the financial assessment for the plans in output form the S&OP. Just Pumps does not involve Finance within the S&OP process, and this is an improvement, due to the need to integrate S&OP with the company hierarchical planning network. In Agtech and LKQ Rhiag, pre-S&OP meetings are conducted, given by the necessity to go down at the details within the departments, considering the evidence from Marketing, the constraints from Operations and Finance (to face with demand and supply uncertainty).

Table 2: effect on organization

Main contingency factors	HOW
<i>demand uncertainty</i>	<i>more demand uncertainty could require pre-meetings, in the agenda of S&OP, for the alignment within the departments.</i>
<i>supply uncertainty</i>	<i>more supply uncertainty could require pre-meetings, in the agenda of S&OP, for the alignment within the departments.</i>
<i>organizational characteristics</i>	<i>higher importance of S&OP lead to the composition of a formal S&OP team with the engagement of the executives, and full engagement/ co-responsibility of all the departments. S&OP is seen as a crucial process in the company.</i>
<i>hierarchical planning network</i>	<i>more integration of S&OP in the company planning network with the inclusion of finance department.</i>

Table 3: effect on measurements

Main Contingency factors	HOW
<i>demand uncertainty</i>	<i>more demand uncertainty leads to more focus on monitoring the sales forecast accuracy and KPIs to analyze the S&OP effectiveness. What-if analysis can be conducted in the S&OP discussion.</i>
<i>demand pattern</i>	<i>higher number of new products lead to more focus on calculation of the sales forecast accuracy.</i>
<i>organizational characteristics</i>	<i>more importance of S&OP process in the organization leads to have measurements which consider the implication of the decisions taken in S&OP on the company profitability.</i>
<i>hierarchical planning network</i>	<i>more integration of S&OP in the company planning network requires more focus on the analysis of discrepancies with the budget figures in the discussion.</i>

5.3 Measurements

For three cases the measurements are focused principally on the calculation and analysis of the trend of the sales forecast accuracy, as KPI of effectiveness of S&OP process. This KPI covers the importance for all the cases analyzed to guarantee a high customer service level, even if impacted of high demand uncertainty. For the demand pattern, Cimbali and Agtech considers the new product launches in the calculation of the sales forecast accuracy, to monitor if the sales are aligned, or not, to the initial expectations. As reported by Grimson and Pyke, 2007, it is important that the effectiveness of S&OP is measured, to improve it over time, with the aim to achieve higher level of plan integration. For the contingency factor “hierarchical planning network” there is also the measurement of the discrepancy with the sales budget. Agtech has reached the stage 5, since all the measurements are done considering the implications on the company profitability. A possible improvement could be on the sophistication of the models used, such as, as reported in Ohlson et al.2022, with the use of artificial intelligence (AI). For Pumps, which has reached the lower stage of maturity (between the stage 2 and 3), it is considered important, due the demand uncertainty, to include in the discussion, during S&OP meeting, a KPI for the S&OP effectiveness, such as the calculation of accuracy biddings vs actual orders. To date, what-if analysis are conducted, principally simulating the impact in function of possible customer/bidding variations. Furthermore, it will be important to add the discussion of the discrepancy with the budget figures.

5.4 Information technology

For the demand and supply uncertainty, three out four cases use an APS to support the planning, with the data centralized in the ERP of the company. One case has reached the fourth stage, using in parallel a revenue tool which operates concurrently. For the organizational characteristics, the next step for this company is to have an integrated solution which optimize the profitability of the company (Amico et al. 2023b) with the use of AI. For S&OP all the cases use a S&OP workbench where collect the data from all the departments, visible for all the participants to the process. Pumps has a tool to analyze the biddings and to assess the backlog and capacity status. What-if analysis are also conducted during S&OP, using a tool simulating the impact in function of customer/bidding variations. The dimension “information technology” is more a dimension that support the S&OP process, higher level of maturity of S&OP in the other dimensions, requires more advanced IT tools (Grimson et al. 2007). Agtech in fact has the need to have an integrated solution which optimize the profitability, because S&OP is seen as instrumental for the profitability of the company.

Table 4: effect on information technology

Main Contingency factors	HOW
<i>demand uncertainty</i>	<i>more demand uncertainty requires to integrate APS to the ERP and with the use of AI, with a revenue tool which operates concurrently.</i>
<i>supply uncertainty</i>	<i>more supply uncertainty requires to integrate APS to the ERP and with the use of AI, with a revenue tool which operates concurrently.</i>
<i>organizational characteristics</i>	<i>more importance of S&OP process in the organization requires more integrated solution which optimizes the company's profitability and a S&OP workbench.</i>

5.5 S&OP plan integration

In Agtech the stage reached is 5, for the organizational characteristics the process is viewed as a crucial business process for the profitability of the company, with a high integration among the plans. In fact, as reported by Grimson et al. 2007, the level of plan integration is strongly related to the stage of maturity reached for meeting and collaboration, organization, and measurements. It is the case of Agtech, which has worked properly on these dimensions to fulfil the need from the context in which operates. Two cases are in the stage 4, in which the plans are tempered both top-down (sales budget) and bottom-up (evidence from the departments). In one case it is missing yet the integration of S&OP with the budget indication, but the aim is to add this part as next step of improvement.

Table 5: effect on S&OP plan integration

Main contingency factors	HOW
<i>organizational characteristics</i>	<i>more importance of S&OP process requires the plans are higher integrated and tempered both top-down and bottom-up. S&OP is seen as a crucial process for the profitability of the company.</i>

6. Conclusions

As reported by Tuomikangas et al. 2014, the basic setting of S&OP is not effective for all the organizations. In fact, there is a growing need, both from academics and practitioners, to explore many contexts to figure how the setting of S&OP could vary. This study has the scope to study, through a multi-case study, how a company decides to define, in function of its contingency factors, the current and desired setting of S&OP. The lens of contingency theory has been chosen properly to support this study in the answering of the research question. The companies, object of this study, belong to four different specific industry. They are all big size company with a mature S&OP process implemented. This study shows, firstly, that the main impactful contingency factors in the decision for the current and desired setting of S&OP are: demand

uncertainty, demand pattern, supply uncertainty, organizational characteristics, and hierarchical planning network. Specifically, for the “meeting and collaboration” dimension, the more impactful contingency factors are: demand uncertainty and supply uncertainty. Higher levels of demand uncertainty require more integration of the customers in the S&OP. Even for higher supplier uncertainty, it is important to include in the process more suppliers. Both demand and supply uncertainty could lead the company to choose more frequently run of S&OP meetings to deal with. Concerning the “organization” dimension, for higher levels is important to have in the S&OP agenda the pre-alignment meetings. The same for higher supply uncertainty, it is important to consider a step of pre-alignments, within the departments, in the agenda. Due to the organizational characteristics, higher importance of S&OP in the company lead to the composition of a formal S&OP team, with the active participation of the executives in the process. From a hierarchical planning perspective, the inclusion of the finance department in S&OP is instrumental to integrate S&OP in the planning network of the company. For the “measurement” dimension, to guarantee high customer service level, it is important to monitor the sales forecast accuracy. In case of high number of new product launches (demand pattern factor), it is important to include the new product launches in the calculation of the sales forecast accuracy. From a hierarchical planning perspective, high integration in the network requires analysis of discrepancies with the budget figures. About the “information technology” dimension, higher demand and supply uncertainty require an APS to support the planning, with the data centralized in the ERP of the company, and a pricing tool which operates concurrently. Higher maturity of S&OP needs integrated solution which optimize the profitability of the company. A S&OP workbench is important to collect the data from all the departments, visible for all the participants to the process. For the “S&OP plan integration”, higher levels of integration require the plans are tempered both top-down and bottom-up. To reach the maximum stage, S&OP must become a crucial business process for the profitability of the company. This study, from an academic perspective, offers new insights in the field of OM PCR. For practitioners, this study gives a guide supporting the definition of S&OP maturity, detailed per dimension as suggested by Grimson et al. 2007. Nevertheless, this study has both limitations in terms of generalization and in terms of time. Concerning the generalization, this research considers four case studies belonging to four different contexts, but to the same country (Italy). Accordingly, a possible future path could be the study of more additional contexts, belonging to different countries, to add additional insights on how define properly the S&OP maturity to reach. In terms of limitation in time, the choice of longitudinal studies could be a solution to cover larger time horizon, with a detailed evolution over time of the S&OP maturity. Another avenue could be related to the study of the qualitative and quantitative effect of the contingency factors on the S&OP performance of the organization (company profitability or other indicators). Furthermore, another study could be the impact of the AI to improve the models used during the

S&OP process. A further path of studies could be even to consider different theoretical lenses, to understand how can change the decision on the S&OP maturity setting.

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