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**"THE ROLE OF FORECASTING AND STRATEGIC CONSENSUS IN
IMPROVING S&OP PROCESS PERFORMANCE:
THE DAFRAM S.P.A. CASE"**

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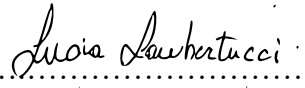
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INTRODUCTION

In recent decades, the increasing complexity of global markets has forced companies to adopt more advanced and integrated practices to manage their operations and effectively respond to competitive challenges. Not by chance, Sales and Operations Planning (S&OP) has emerged as a crucial process that enables businesses to ensure an optimal balance between supply and demand, coordinating various business functions such as Sales, Production, and Resource Management. In particular, Demand Forecasting and Strategic Consensus between different organizational levels are key elements for the success of the S&OP Process, as they allow business decisions to be aligned with strategic objectives, improving the company's ability to respond promptly to market dynamics.

Demand forecasting is essential for understanding and anticipating market needs, using historical data and predictive models to outline possible future scenarios. Today, with the advancements in Artificial Intelligence and Business Intelligence, companies have the possibility to rely on increasingly sophisticated tools to enhance the accuracy of forecasts, reducing the risk of overproduction or stock shortages. Similarly, Strategic Consensus represents a fundamental condition to ensure that all business functions are aligned with organizational goals and priorities, fostering greater internal cohesion, reducing conflicts between different departments and going together to the company's end goal.

The current research aims to analyze how Demand Forecasting and Strategic Consensus are able to improve the performance of the S&OP Process, with a focus on the case study of Dafram S.p.A., an Italian leader in the manufacturing of industrial valves for the Oil & Gas sector. In particular, Dafram S.p.A. is an interesting example of how a manufacturing and family-conducted company faces the challenges of a highly competitive and regulated industry, where the ability to manage demand effectively and optimize production resources is crucial for maintaining a competitive advantage.

The methodology adopted includes the use of a structured questionnaire administered to the members of Dafram's Top Management Team to assess the Maturity level of the S&OP Process and the degree of Strategic Consensus within the TMT members. The collected data have been analyzed to identify possible misalignments between different organizational levels and propose recommendations aimed at improving the efficiency of the S&OP Process.

Therefore, the primary objective of the research is to provide a practical contribution to the literature on S&OP, offering operational insights that could be applied not only in Dafram S.p.A, but also in other companies operating in similar sectors or having similar characteristics.

It is possible to state that, in summary, the thesis explores the intersection between theory and practice, analyzing how Advanced Forecasting Tools and Strategic Consensus Models are able to enhance business processes by promoting greater integration between different functions and contributing to the achievement of strategic goals. Through a detailed analysis of the case study and the application of theoretical models, the aim is to demonstrate how strengthening Strategic Consensus and adopting Demand Forecasting Techniques are fundamental levers for improving S&OP Performance, in particular, and overall Business Performance, in general.

CHAPTER 1 - DEMAND FORECASTING FOR EFFECTIVE S&OP

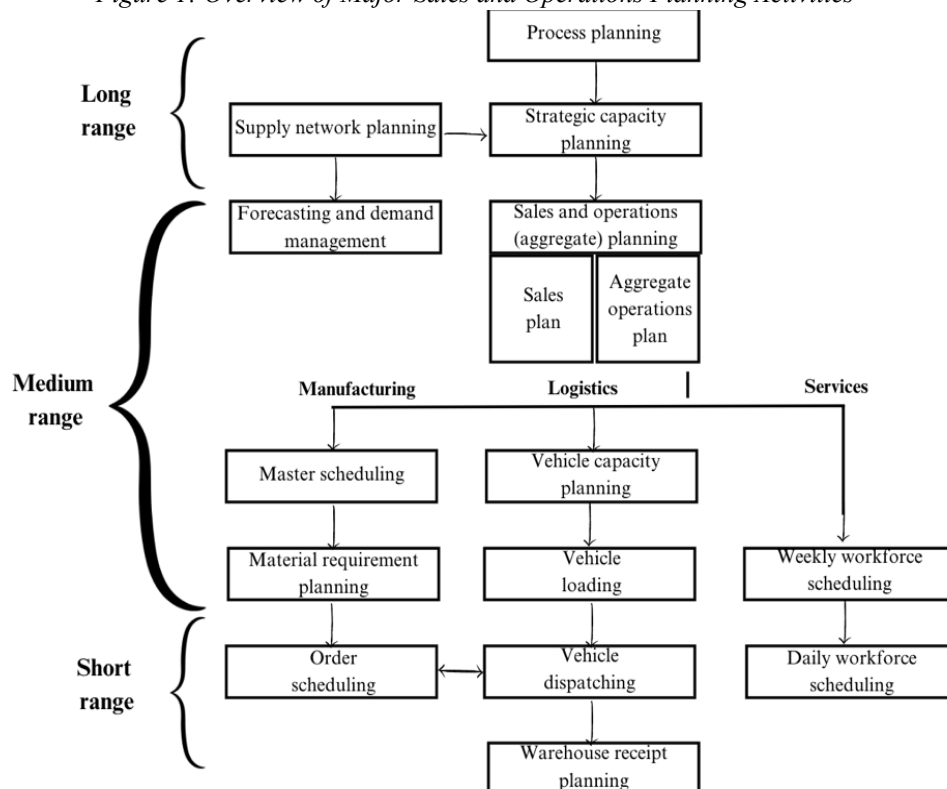
INTRODUCTION TO THE CHAPTER.

In companies' operations, two of the main activities required for the achievement of strategic goals and for the maintenance of a competitive advantage are Forecasting and Planning. In particular, the balance between supply and demand is guaranteed by the integration of various organizational functions, generally executed by the Sales and Operations Planning (S&OP) Department, for which Demand Forecasting is a fundamental starting point, because it leverages historical data and predictive analysis to anticipate future market trends and customer demands.

Not by chance, the chapter explores the complexities of S&OP Processes, probes into multiple Demand Forecasting techniques, and stresses the value of analytical tools to boost the veracity and reliability of forecasts. It is through an examination of qualitative and quantitative Forecasting Methods that the research aims at providing insights of how businesses could optimize their Planning Processes to meet market needs.

1. SALES AND OPERATIONS PLANNING.

Figure 1: Overview of Major Sales and Operations Planning Activities



Source: F. Robert Jacobs, 2017

According to Grimson and Pyke (2007), Sales and Operations Planning (S&OP) is a business process designed to connect the Corporate Strategic Plan with Daily Operational Plans, enabling companies to balance the demand and supply for their products (Gregory, 1999; Dwyer, 2000; Wight, 1999). S&OP is often viewed as a method to develop a consensus-based operations plan that aligns with forecasted demand. Others see it as a dynamic approach for swiftly adjusting to market changes and operational conditions (Smith, 2004; Dwyer, 2000; Wight, 1999; Olhager, Rudberg, & Wikner, 2001).

Typically, S&OP plans for the next 1-18 months and focuses on product families rather than individual Stock Keeping Units (SKUs) (IOMA, 2003; Lapide, 2002, Dwyer, 2000). In fact, forecasting exact future demand for products or services is challenging, but companies could predict the sales of a group of similar products, known as “Aggregate Demand.” Over time, ensuring sufficient aggregate capacity is crucial so that product schedulers are able to manage the daily and weekly launches of individual product orders within those capacity constraints to meet short-term demand (F. Robert Jacobs, 2017).

The S&OP Process involves a series of meetings to discuss activities illustrated in Figure 1, culminating in a high-level meeting where significant intermediate-term decisions are made. Further details regarding the S&OP Process will be provided in the following Chapter.

With advancements in information technology, there have been attempts to implement technological solutions without considering business processes, which often leads to failure (Radjou, Orlov, & Herbert, 2003). As stated by Lapide (2004b), traditional S&OP is “internally focused and technologically challenged”. In fact, he proposes that the application of the S&OP Culture across all functions and levels as well as with suppliers and customers to become “Best in Class” (Lapide, 2002).

The determination of expected demand is placed at the first step of the process to undertake to move from the Demand Forecasting to the Capacity Planning activities. From that information, detailed Sales and Operations Plans for meeting material requirements are made. Specifically, the Aggregate Operations Plan precedes the Master Production Scheduling (MPS) and the Material Requirements Planning (MRP), and its main purpose is to specify the optimal combination of production rate, workforce level and inventory on-hand. Finally, Capacity Planning Methods are drawn up to verify and assess the resources required to meet product demand (Tenhiälä, 2011).

In essence, there are the following three Production Planning Strategies, on which the Aggregate Production Planning is focused, that involve trade-offs among the workforce size, work hours, inventory, and backlogs (Jamalnia, Yang, Xu, & Jamali, 2019).

- a. Chase Strategy. It matches the production rate to the order rate by hiring and laying off employees. The success of the scheme depends on having a pool of easily demand applicants to draw on as order volumes increase. For instance, during peak hours or special events, the restaurant chain Mc Donald's temporarily hires more staff to meet the increased demand and then reduces the number of employees when demand decreases.
- b. Stable Workforce with Variable Work Hours Strategy. It varies the output by changing the number of hours worked through flexible work schedules overtime. By doing that, the company is able to match production quantities to orders. For example, Toyota adapts production to changes in demand without having to hire or lay off employees.
- c. Level Strategy. It means maintaining a stable workforce working at a constant output rate to absorb shortages and surpluses through inventory accumulations, order backlogs, and lost sale. Unilever uses the methodology, thus avoiding modifying the number of workers according to fluctuations in demand.
- d. Subtracting Strategy. Ultimately, managers might decide to outsource a certain part of production process requirements, instead of employing and firing people unethically. In that way, a manufacturer may riskily lose control over schedule and quality, unless she has a very strong relationship with suppliers (F. Robert Jacobs, 2017).

2. DEMAND FORECASTING.

In the 1980s, Science Fiction was thought to be the source of future projections prediction, and men of science or academics were charmed with it. Today, the process of using predictive analysis of historical data to assess and anticipate future trends that could ultimately help to develop Sales Strategies and Supply Chain Management is known as Demand Forecasting, and serves as a modern-day crystal ball, assisting organizations in uncovering the time to come and making more informed decisions (Polestar Solutions & Services , 2023).

Demand Forecasting has its unique focus and characteristics and relies on different approaches and methodologies, being a critical aspect for any business. As claimed by Sinuany-Stern (2021), there are two principal methods of Demand Forecasting; the first one is Passive Demand Forecasting, which simply predicts and tries to understand what it is going to happen in the future by analyzing past data, while the second one is the Active Demand Forecasting,

which focuses on a more dynamic approach by collecting new data and by considering various external factors, including market conditions and economic indicators. Moreover, as stated by Krishna (2023), the Demand Forecasting procedure includes several key points to focus on, the coming ones:

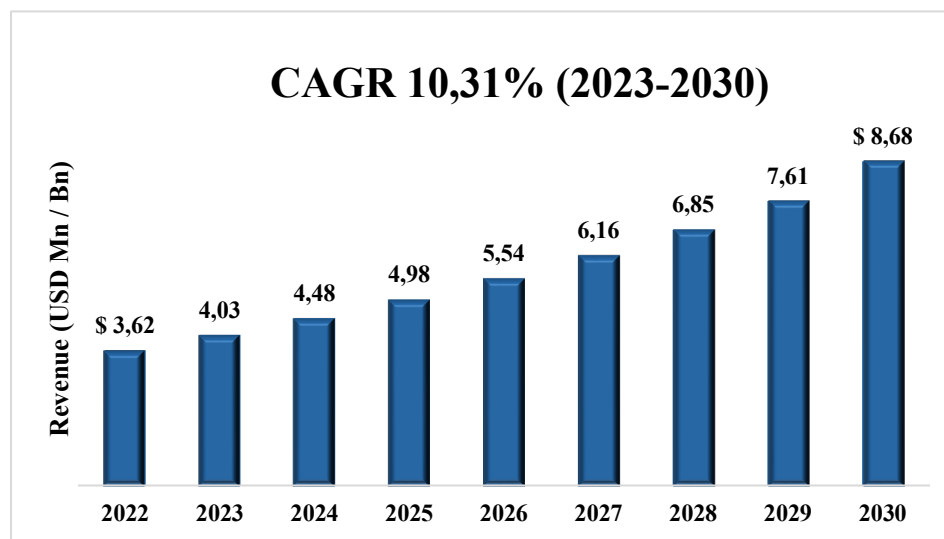
1. The first concentrates on the collection and analysis of data because, undoubtedly, the consistency of any forecast heavily relies on the quality of the stored data.
2. The second is about the utilization of technology and devices, from robust data analytics tools to AI-driven forecasting programs, for the improvement of the precision and efficacy of the Sales Forecasting Process itself.
3. The third deals with the importance of the alignment and integration between functions. To guarantee an inclusive perspective, Sales Forecasting should not be an isolated effort completed exclusively by the sale managers, but rather should involve cooperation across all pertinent departments.
4. The last relies on the continuous monitoring and adjustments to execute periodically because markets and conditions constantly change. It should come as no surprise that ongoing monitoring enables companies to become and remain flexible and adaptable.

It is possible to convincingly saying that gone are the days of relying merely on historical data. Krishna (2023) strongly highlights that today's advancements and progresses in technology, data analytics, and Artificial Intelligence are revolutionizing the way companies anticipate coming sales curves and customer demand. As these advancements gradually develop, businesses must upgrade their ways of working, also from the organizational point of view, to boost growth and stay ahead and in line with the competition.

2.1. Demand Forecasting in S&OP.

S&OP brings together various departments, strategies and objectives to achieve harmony across the organization and Demand Forecasting provides the crucial beat, guiding the overall decision-making process (Kumar, 2023). Businesses improve performance, eliminate bottlenecks, and rationalize operations with a shared vision and faithful Demand Forecasts. Moreover, companies that integrate the function into their S&OP Operations effectively see order fulfillment rates that rise and are typically 15% to 20% higher than those that do not. It also makes sense for enterprises to adopt the Artificial Intelligence and Business Intelligence insights trend to gain benefits over competitors and the greatest market insights available, as the numbers clearly show that these fields have a brighter future than the sun (Destino, Fischer, Müllerklein, & Trautwein, 2022).

Figure 2: Global Demand Planning Solutions Market



Source: Zion Market Research, 2023

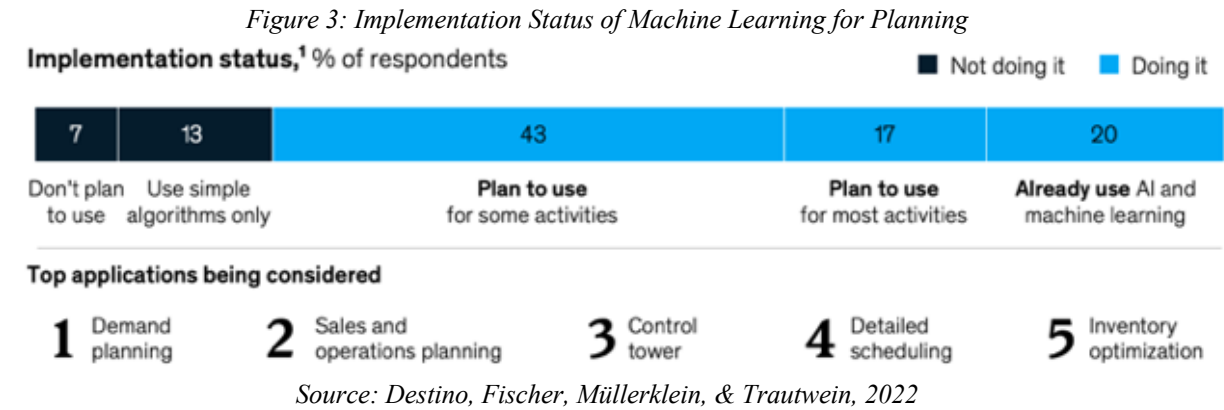
Figure 2 shows that the rise of Demand Forecasting solutions is imminent. According to the Zion Market Research (2023), the global Demand Planning solutions market is estimated to be USD 8.681 Billion by 2030 with a Compound Annual Growth Rate (CAGR) of 10.31% between 2023 and 2030. These latter numbers are exorbitant as the market was worth just USD 3.62 Billion in 2022.

North America, which had an impressive 41.1% of the global market share in 2022, is predicted to experience the fastest growth in the Demand Planning solutions market worldwide. Because there are so many early adopters and important players in the US, the nation's sophisticated IT infrastructure contributes to a higher growth (Zion Market Research, 2023).

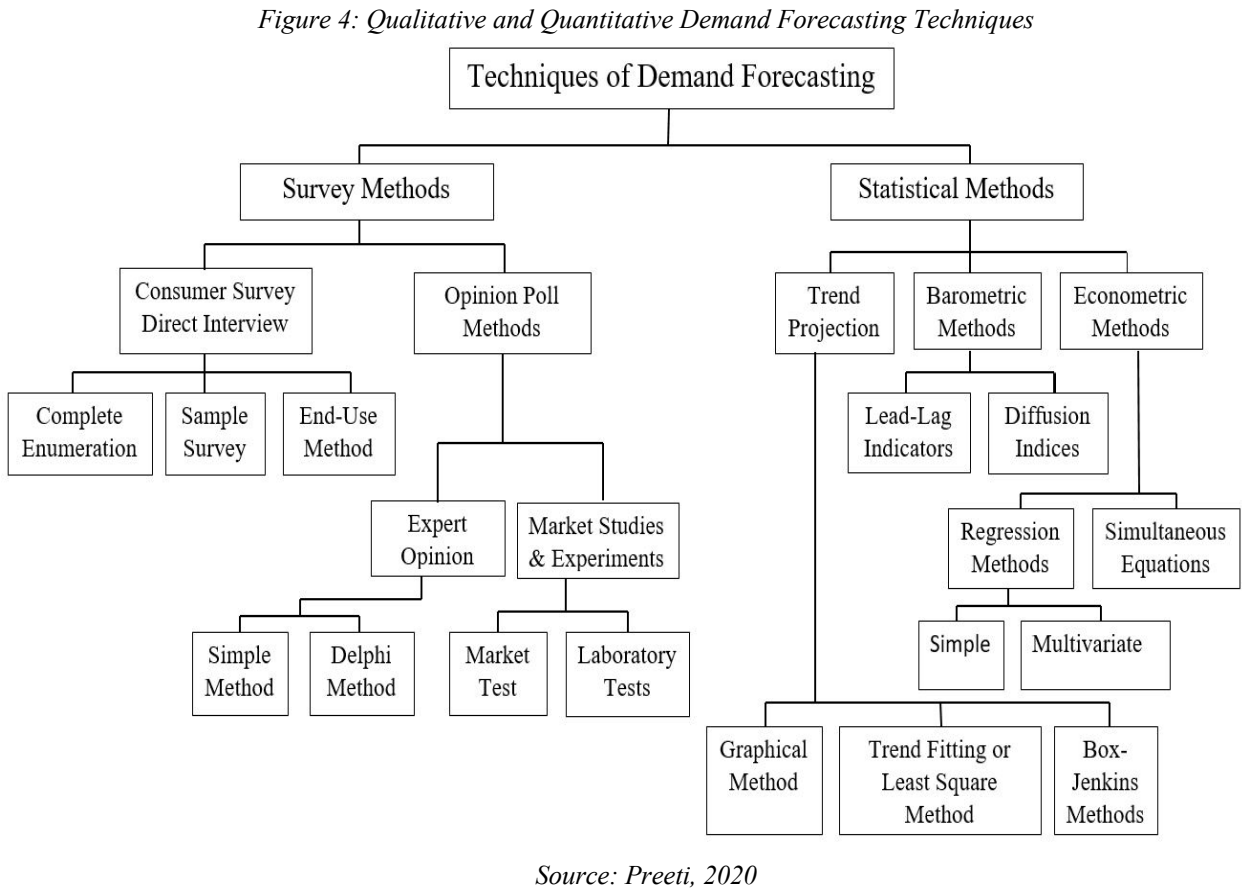
Despite the advantages that modern supply-chain planning IT systems offer, an overwhelming majority of enterprises still use manual or outdated methods. Close to 3/4 of supply-chain functions rely on the simplest method: spreadsheets. Supply-chain leaders know that current methods need to change and are taking steps in that direction. McKinsey&Company (2022) surveyed and discovered that 90% of the executives plan to implement a new solution in the next 5 years, and 23% have already done so. 20% of executives have implemented AI and Machine Learning for some type of supply-chain-planning activity, and another 60% plan to in the future (See Figure 3).

Businesses hold onto outdated systems even though updates could result in significant benefits since it takes a huge amount of time and money to replace them. The intricacies of companies' supply chain determine the resources needed for an upgrade. Just to have a clear idea, businesses take an average of 2.8 years from vendor selection to full deployment, and in

extremely complicated supply chains, it takes 4-6 years and €55-110 million to fully install a new supply-chain planning system (Destino, Fischer, Müllerklein, & Trautwein, 2022).



3. DEMAND FORECASTING TECHNIQUES.



Planning involves a deliberate set of actions aimed at achieving improvements in “Future Qualities” that would not otherwise be realized within a given frame of time. It highlights “Future” as a key concept. However, the term “Qualities” suggests that the future is not an objective reality but rather a subjective construction, as everyone has their own interpretation of what constitutes “Good Quality”. A forecast, being a statement about future

conditions, is inherently arbitrary rather than a statement of fact, and the term “Forecasting” encompasses both quantitative predictions of future developments and qualitative explorations of possible futures (Schnaars, 1986). Neither Forecasting Method is considered better than the other, instead, it is recommended to use a good balance of both qualitative and quantitative methods.

Moreover, as already stated, accurate Demand Forecasting is key for aligning Production Planning and Capacity Planning with market needs and requirements. The main qualitative and quantitative methods, illustrated in Figure 4 and ranging from Direct Surveys to Advanced Statistical Analyses, offer unique advantages and disadvantages, and are further explained below (Preeti, 2020).

3.1. Qualitative Forecasting Techniques – Survey Methods.

Commonly, only short-term Demand Forecasting employs the techniques represented in the left-hand side of Figure 4. Specifically, the reference is to Consumer Surveys that are brought into play to gather information about purchasing intentions and future buying plans.

3.1.1. Direct Interview Method.

It is the most direct and simple way of assessing future demand by interviewing potential consumers and asking the total quantity of the product in question they would be willing to buy at different prices, over a given period of time (Ken, Forecasting Methods for Product Managers, 2022). Consumers could be interviewed by any of the following methods, depending on the purpose, time, and cost of survey:

- a. Complete Enumeration, in which practically every possible customer is contacted and asked if they plan to buy the products in reference. The consumer’s suggested quantities are added together to determine the probable final demand for the product.
- b. Sample Survey, in which only a few percentages of customers are chosen at random, or using a Sampling Technique, from the pertinent market for the product. Then, chosen customers are polled, either in-person or by mail, with questions about their income, the quantity of the product that are willing to acquire, and the price that are willing to pay for the pre-declared quantity. All the product’s customers are therefore thought to be covered by the information gathered, because results are pretended to be generalized.
- c. End Of Use Method, in which it is required to draft a timetable of the possible aggregate future demand by industries and various other sectors. All the technological, structural, and other changes, which might influence the demand, must be considered.

3.1.2. Opinion Poll of Experts.

Insights from people who have significant knowledge about the market, such as Sales Managers, Professional Marketing Consultants and Sales Executives, are gathered thanks to the involvement of the following methods:

- a. Expert-Opinion Method, which takes the opinion of experts to forecast demand of the product. Experts could be interviewed by any of the upcoming ways (Rowe, 2001):
 - i. Simple Expert Opinions Poll, where the experts may be from the firm itself, for example the Sales Managers, and are supposed to be able to provide an approximate, if not precise, estimation of the demand for their firm's product, in the region or area in which it operates. The estimates are obtained thanks to face-to-face meetings, and then added up to get the overall rough final demand. Alternatively, the experts might be from outside the firm.
 - ii. Delphi Technique, which is an extension of the Simple Expert Opinion Poll Method and is a way of getting the opinion of experts without face-to-face interactions, to avoid that the idea of the most influential people prevails. Consensus is attempted to be reached, by questioning them, repeatedly, until the responses appear to converge to one.
- b. Market Studies Experiments is another substitutive practice of collecting information regarding final demand, in the listed modalities (Mummolo & Peterson, 2019):
 - i. Market Tests, where companies first select certain areas of representative markets - typically 3 or 4 cities with similar characteristics - and conduct experiments by altering prices, advertising expenditures, and other controllable variables in the demand function, assuming constant the others. Based on the collected data, elasticity coefficients are computed and utilized alongside the other demand function variables to assess the product's demand.
 - ii. Laboratory Tests, which involve the creation of artificial markets where consumers are provided with money to spend, with goods having varying prices, packaging, and displays. The analysis measures consumers' responses to changes and offer the same insights as Market Experiments but are generally less expensive and have the added advantage of better control over external variables.

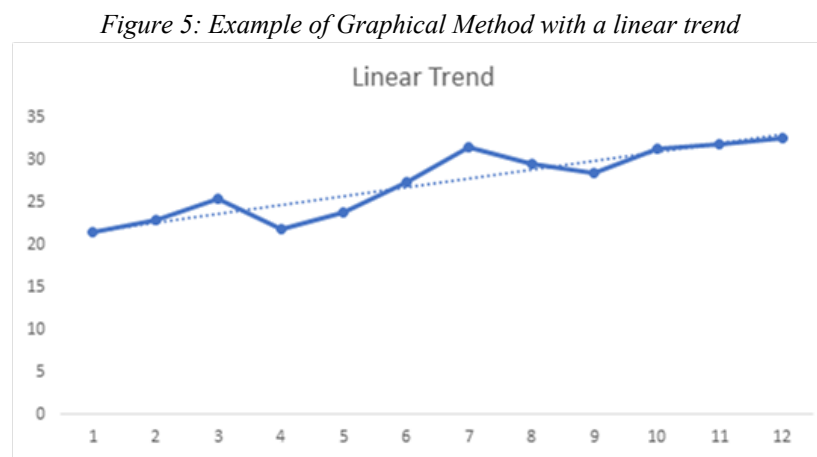
3.2. Quantitative Forecasting Techniques – Statistical Methods.

Statistical methods are often preferable for Demand Forecasting because subjectivity is minimized; because the estimation process is scientific, relying on the theoretical relationship between dependent and independent variables; and finally, because the results are more reliable and cost-effective.

3.2.1. Trend Projection.

Time series data is the alignment of the values of a variable in chronological order of days, weeks, months, quarters, or years, and the basic assumption is that past trend is likely to continue. It is possible to refer to the sequent mechanisms:

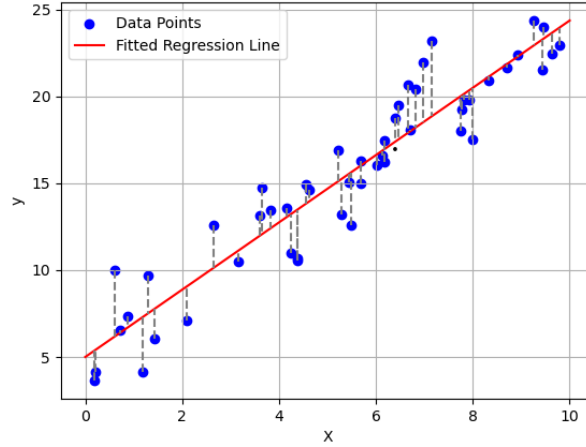
- a. Graphical Method (see Figure 5), where the past values of the variables are shown on the vertical axis and time on the horizontal axis. Available data are plotted, and a line is drawn through all the points. Then a free-hand line, representing the Trend, is drawn from the first dot of the time series to the last one. The solid fluctuating line in the graph shows the Actual Trend, while the dotted line shows the Secular Trend. By extending the Secular Trend Lines, it is feasible to forecast an approximate demand for the future (Analytics Vidhya, 2020).



Source: Analytics Vidhya, 2020

- b. Least Squares Method (see Figure 6) is a powerful tool to estimate the coefficients of a linear function, based on the minimization of squared deviations between the best fitting line and the given original observations, as shown by the data points in blue in the graph. Data on demand and time in the form of equations are fit and then demand for the future period is projected (Ejlli, 2023).

Figure 6: Example of Least Squares Method with errors (residuals)



Source: Ejlli, 2023

- c. Box-Jenkins Method, also called the Auto-Regressive Moving Average (ARIMA) Method, has been suggested by G E P Box and G M Jenkins, and it is suitable for Demand Forecasting only with stationary time-series data, which do not reveal a long-term trend. Specifically, the ARIMA Model is a type of Regression Analysis for predicting future movements by examining the differences between values in a time series rather than the actual values. The Auto-Regressive component (AR) involves a model where a changing variable regresses on its own prior values. The Integrated part (I) involves differencing the observations to make the time series stationary, meaning data values are replaced by the differences between consecutive values. Finally, the Moving Average component (MA) captures the dependency between an observation and a residual error from a Moving Average model applied to lagged observations (Hayes, 2024).
- d. Exponential Smoothing, although not explicitly mentioned in Figure 4, is a forecasting technique that should be integrated due to its widespread use. Derived from the book by John E. Hanke and Dean Wichern, *Business Forecasting* (2014), it is a popular method for short-term forecasts, primarily, that assigns exponentially decreasing weights to past observations, meaning that more recent observations have a stronger influence on the forecast than older ones. The Simple Exponential Smoothing model is particularly effective for time series data that exhibits a relatively stable pattern without significant trends or seasonality and the following one is the typical formula (Hanke & Wichern, 2014):

$$\hat{Y}_{t+1} = \alpha Y_t + (1 - \alpha) \hat{Y}_t$$

For time series data with a trend, Simple Exponential Smoothing tends to lag behind. Holt's Double Exponential Smoothing method extends Simple Exponential Smoothing by

adding a second equation to update the Trend Estimate, where L_t is the estimated level, T_t is the estimated trend, β is the trend smoothing constant, and p is the number of periods ahead to forecast (Hanke & Wichern, 2014):

$$L_t = \alpha Y_t + (1 - \alpha) (L_{t-1} + T_{t-1})$$

$$T_t = \beta (L_t - L_{t-1}) + (1 - \beta) T_{t-1}$$

$$\hat{Y}_{t+p} = L_t + p T_t$$

3.2.2. Barometric Method.

In the 1920s, the Harvard Economic Service developed the Barometric Method and put it into practice. Statistical indicators, when combined, could be exerted as a barometer of changes in the economy. The state of the entire economy and the demand for the company's own product must be connected, and the basic idea is to create an index of pertinent Economic Indicators and use its changes to predict trends (Michio, 1963).

The two types of indicators to which the technique refers are as follows:

- a. Lead-Lag Indicators, for which the basic approach is to construct an index containing the relevant Economic Indicators and to forecast future trends based on it, as stated before, using the consequential possible manners:
 - i. The Leading Series consist of indicators that go up or down ahead of other past series. They are easy to spot, unresponsive and hard to change, and definitive results of the past. Examples include Stock Market Returns, as changes in Stock Market Indexes predict future economic activity, and the Consumer Confidence Index (CCI), which indicates higher future consumer spending when it is rising.
 - ii. The Coincidental Series include indicators that simultaneously move up or down with the overall level of economic activity, reflecting its current state. Examples include GDP, which reflects the overall economic activity at the current time, as well as Employment Levels and Personal Income, both of which provide snapshots of the labor market and individual earnings.
 - iii. The Lagging Series comprise of indicators that follow a change after some time-lag, confirming trends, if there are, and after they have occurred. They are responsive to team actions, predictor of future success and difficult to uncover. Examples include the Unemployment Rate, which tends to rise after the economy has started to decline, Interest Rates, which are often adjusted after changes in

economic conditions become evident, and Outstanding Loans and Credits, which reflect past borrowing trends.

Coincidental and Lagging Indicators are useful to verify and eventually confirm what Leading Indicators have already suggested.

- b. Diffusion Indexes are a different alternative, especially used when selecting the appropriate Lead-Lag Indicators is problematic, particularly if some of them belong to more than one category. Additionally, it is not recommended to depend solely on one. Expressly, a Diffusion Index represents the percentage of indicators showing an upward trend and is calculated by dividing the number of indicators in a specific category that are rising or falling by the total number of them. Examples include the Purchasing Managers' Index (PMI), which measures monthly changes in manufacturing output, employment, new orders, inventories, and vendor deliveries, and the Conference Board Leading Economic Index (LEI), which aggregates ten diverse economic indicators that precede changes in the business cycle (Harris, 1991).

3.2.3. Econometric Methods.

Econometric Methods are considerably more reliable than already discussed methods, and, consequently, Econometric Methods are extensively employed for predicting demand for products, groups of products, and for the entire economy (Petropoulos, 2022).

- a. Regression Method is a statistical technique for the estimation of unknown values of one variable, thanks to the knowledge of another one. The Dependent Variable is the one that the company aims to predict (Y), while the variable used to predict the variable of interest is called the Independent Variable (X). There are two linked methodologies, the sequent:

- i. Simple Methods, where a single Independent Variable (X) is used to estimate the variable to be forecast, the Dependent one (Y). The formula below illustrates the typical equation, where β_0 represents the intercept, β_1 denotes the slope coefficient, and ε signifies the error term, which should be as small as possible (San, 2021).

$$\hat{y} = \beta_0 + \beta_1 X + \varepsilon$$

- ii. Multivariate Methods, where the final function is made up of many variables ($X_1, X_2, X_3 \dots$), because more than one Independent Variable is used to estimate the variable to be forecast (Y). The formula below represents the ordinary equation, an extension of the previous one, with the unique difference that there

are as many slope coefficients as the Independent and Explanatory variables considered (Dawson, 2021).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \varepsilon$$

- b. Simultaneous Equations involve Mutually Dependent Variables, where the value of one variable is influenced by the values of the others. It is extremely important in econometrics because it is able to capture the interrelationships between economic factors. Moreover, each equation generally includes Stochastic Elements or Error Terms to account for unpredictability, and solving equations together provides a detailed understanding of the mesh between variables in an economic context (Haavelmo, 1943).

To conclude, it is possible to affirm that Demand Forecasting Methods are becoming more and more crucial, but also highly developed and serve as a starting point for both the Production Planning and Capacity Planning.

Not by chance, Demand Forecasting is one of the central activities of Medium-Term S&OP, on which the current research is mostly focused, and forms the company's foundation for strategic decisions. Within the Medium-Term Operations landscape, that generally roughly goes from 3 to 18 months, Demand Forecasting not only provides an estimation of future demand for any kind of product and/or service but is also employed as a key input for other fundamental planning activities, including Production Planning through Master Production Scheduling (MPS) and Material Requirements Planning (MRP), Vehicle Capacity Planning, Vehicle Loading, and weekly Workforce Scheduling.

On the other hand, Production Capacity involves resources such as production lines, skilled labor, and facility efficiency, and must be aligned with demand forecasts to ensure that customer needs are met by the company itself. Not surprisingly, Capacity Planning is described as the process of translating demand forecasts into concrete and measurable operational capacity. Remember that the degree to which customers' needs are effectively satisfied strongly depends on the Level of Service that the organization wants to guarantee. While medium-term operations focus on day-to-day operational production planning, long-term decisions regarding capacity fall within the domain of long-term S&OP.

Ultimately, the finding to stress is that Demand Forecasting represents the common starting point upon which both Production Planning and Capacity Planning rely, underscoring the critical importance of accurate predictions for the overall success of Business Operations, in general, and for the S&OP Process Performance, in particular.

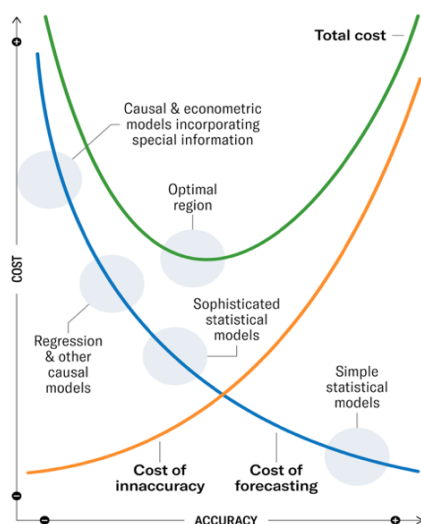
4. CHOOSING THE RIGHT FORECASTING TECHNIQUE.

In the article *How to Choose the Right Forecasting Technique* from the Harvard Business Review (1971), Chambers, Mullick, and Smith emphasize the importance of collaboration between managers and forecasters in selecting the appropriate methods. The latter choice is influenced by the following main key factors:

- a. Purpose of the forecast, because the specific objective determines the appropriate method. For instance, operational decisions taken in the short-term may benefit from different techniques compared to long-term strategic planning.
- b. Dynamics and components of the organization, meaning that understanding the complexity and correlation within the system being forecasted is pivotal. More intricate systems with multiple interdependent variables often require more developed and advanced methods, overall being more costly and time consuming.
- c. Importance, availability and relevance of historical data are also decisive. For instance, Time Series Analysis heavily relies on past data, whereas, on the other hand, Causal Methods are more suited when external variables significantly influence the forecast.

To end, the optimal region, which is where the combined costs of forecasting and inaccuracies are minimized, should be the focal point for companies (see Figure 7).

Figure 7: Cost of Forecasting versus Cost of Inaccuracy



Source: John C. Chambers, 1971

The graph illustrates the trade-offs between Quantitative Forecasting Techniques accuracy and their medium-term costs. Simple Statistical Models may be less costly but also less accurate, leading to higher costs of inaccuracy. Conversely, more sophisticated models, such as Causal and Econometric Models, although more expensive to implement, offer greater accuracy, thus reducing the overall cost of inaccuracy.

To culminate, in the Forbes article *Demand Forecasting is always wrong: three ways to thrive with forecast ambiguity* by Patrick McDonald (2021), it is emphasized that Demand Forecasts are always wrong and very often inaccurate, by definition. Three are the strategies,

suggested by the author, to try to address and repress as much as possible the issue and the main characteristic of Demand Forecasting, that is its uncertainty, which is unavoidable, but still reducible and containable. Firstly, recognizing the uncertainty itself; Secondly, considering various potential outcomes thanks to the usage of Stochastic Analysis and therefore optimizing inventory decisions to counter the problem; Thirdly, comparing predictions with actual results to measure the gap and improve.

Demand Unpredictability is handled with the help of the mentioned simplified strategies that could be further developed and explained in detail, being aware that while forecasts may be imperfect, they are still core for effective planning and decision-making, and always of increasing significance.

5. THE ROLE DEMAND FORECASTING IN S&OP AND CONCLUSIONS.

In conclusion, Demand Forecasting is a cornerstone for the success of the Sales and Operations Planning (S&OP) Process. By integrating historical data with Advanced Predictive Techniques, organizations are able to produce more accurate forecasts, which in turn optimize Resource Allocation, Production Capacity Planning, and Logistics Management.

The ability to anticipate market trends not only enhances operational efficiency but also empowers companies to swiftly respond to evolving market conditions, ultimately strengthening their competitive edge. As outlined in the current chapter, the combined use of qualitative and quantitative Forecasting Approaches, supported by cutting-edge technological tools such as Artificial Intelligence, significantly minimizes the margin of error, enabling businesses to confidently tackle the uncertainties of future demand.

After having explored the importance of Demand Forecasting, it is important to underline that the numerical findings of the actual research are not directly focused on Demand Forecasting Techniques, even if strongly recommended. but instead explore both the Strategic Consensus, a critical aspect for aligning organizational goals across and within departments, and the Maturity of S&OP Process, underlining their benefits for the overall S&OP Process Performance. Additionally, the case study and analytical focus is on Dafram S.p.A., a leading Italian Mechanical Engineering Company based in the Marche region, specialized in the manufacturing of ball valves for the Oil & Gas industry, though not limited to it.

CHAPTER 2 – MAKING THE BEST OF S&OP PROCESS

INTRODUCTION TO THE CHAPTER.

The Sales and Operations Planning Process plays a crucial role in balancing operational capacities and strategic objectives. Specifically, S&OP Processes are suggested to follow some key success factors and to integrate information coming from all departments and from all the steps of the value chains, thereby reducing costs and enhancing responsiveness.

Several Maturity Models are explained, guiding organizations through various stages of process integration from basic to advanced levels, and the role of KPIs evolves through the different Maturity Models' stages, starting with basic financial metrics, and reaching exhaustive measures of forecast accuracy, inventory levels, and profitability.

Do not forget Strategic Consensus, achieved through shared understanding of priorities among managers, which is crucial for communication and coordination. It is for the same purpose that the second chapter presents Strategic Consensus Mapping, an innovative method for analyzing strategic alignment within and between groups, through the application of precise and complex mathematical formulas.

Last but not least, What-If Scenarios are suggested to be integrated into the S&OP Process to permit organizations to simulate hypotheses, evaluate the impacts of endogenous and/or exogenous variables changes on outcomes and sales, and prepare for unexpected future events, anticipating them.

Here are all the insights that aim to offer practical guidance for making the best of S&OP Processes.

1. S&OP PROCESS AND ITS KEY SUCCESS FACTORS.

As already anticipated, S&OP generally follows a pre-determined Five-Step Process designed to align a company's strategic goals with its operational capabilities (IOMA, 2003, 2004b; Kruse, 2004; Lapide, 2004b; Gregory, 1999; Dwyer, 2000; Rooney & Bangert, 2001; Wallace, 2004; Mark, 2004).

1. As reported by Grimson and Pyke (2007), the first step involves the Sales Team holding pre-meetings to develop a baseline Demand Forecast, which has to be unconstrained, considering potential customer demand instead of the company's capacity to produce. Adjustments are made for expected responses to Marketing initiatives, such as trade

shows, advertising campaigns, and promotions. New product launches and product discontinuations information are also incorporated, resulting in a consensus-based demand forecast. One of the most critical aspects of the forecasting process itself is the determination of the planning horizon, which typically spans from 6 months to over 3 years, depending on the industry, product seasonality, and timing within the business cycle. For instance, long production lead times or high seasonality industries (apparel, pharmaceuticals, automotive products, etc.) tend to use longer planning horizons. Conversely, industries with shorter lead times and low seasonality (commodities, etc.) may adopt shorter horizons.

2. In the second step, the Operations Team holds pre-meetings to obtain data on inventory strategies (whether to build up or draw down inventory), internal production and supply chain capacity, and in most of the cases the process involves Manufacturing Resource Planning (MRP) modules to create a detailed, time-phased projection of requirements and future plans. The Operations Team then uses the Consensus-Based Demand Forecast from the first step to formulate the Rough-Cut-Capacity-Plan (RCCP), an initial supply plan aimed at fully satisfying the anticipated demand.
3. The third step is the formal S&OP meeting, where the cross-functional team, including of Sales, Marketing, Operations, and Finance Representatives, develops the final Operating Plan for the upcoming period. The meetings frequency varies; monthly meetings are common, but companies have shifted towards more frequent sessions to remain agile and responsive. For example, some hold daily briefings, though there is some debate about the potential for such recurrent meetings to disrupt the efficiency of the production process (Kruse, 2004; Lapide, 2002; Slone, 2004; IOMA, 2004b; Kapp, 2000; Radjou, Orlov, & Herbert, 2003).
4. The fourth step deals with the distribution and implementation of the agreed plan, which predominantly involves the Operations and Sales Teams, where the former is generally tasked with meeting the production targets outlined in the plan itself, while the latter typically does not need to adjust anything.
5. The fifth step is to measure the S&OP Process effectiveness through metrics that will be deeply analyzed in the 3rd section of the current Chapter. They usually include line fill rates, inventory levels, obsolete inventory, frequency of expediting orders, stockouts, cost variances, quality metrics, and capacity utilization (IOMA 2004b; Wing & Perry, 2001; Sheldon, 2006).

Furthermore, according to Larry Lapide (2004b), 12 are the key success factors that improve S&OP Processes (see Figure 8). First, it is essential to hold regular, routine S&OP meetings to ensure ongoing communication and alignment. Meetings should follow a structured agenda to maintain focus and be preceded by pre-meeting preparation, involving the development of a baseline Demand Forecast and Rough-Cut supply plans to support discussions, as seen in the previous section. Cross-functional Participation is required, with representatives from Sales, Marketing, Operations, Finance, and Supply Chain collaborating to ensure a holistic approach, where participants must be empowered to make decisions during meetings. The S&OP Process should be managed by an unbiased, responsible organization that maintains discipline and consistency. Internal Collaboration is key to achieving consensus and accountability, while an unbiased baseline forecast serves as a reliable starting point. Moreover, joint Supply and Demand Planning ensures that both aspects are balanced and in line. As already stated, measuring the process itself is crucial for Continuous Improvement, as well as supporting the process by Integrated Supply-Demand Planning Technology to provide synchronized data and tools. Last but not least, incorporating external inputs from customers and suppliers, such as Point-Of-Sale data and Collaborative Planning Information, enhances S&OP Process precision.

Figure 8: Success Factors of Sales & Operations Planning (S&OP) Process

1.	Ongoing, routine S&OP meetings	7.	Internal collaborative process leading to consensus and accountability
2.	Structures meetings agendas	8.	An unbiased baseline forecast to start the process
3.	Pre-work to support meeting inputs	9.	Joint supply and demand planning to ensure balance
4.	Cross-functional participation	10.	Measurement of the process
5.	Participants empowered to make decisions	11.	Supported by integrated supply-demand planning technology
6.	An unbiased, responsible organization to run a disciplined process	12.	External inputs to the process

Source: Lapide, 2004b

1.2. Enhancing S&OP with Information Sharing.

Building on the key success factors examined, Information Sharing also plays a unique role. A case study discussed in the *Journal of Operations Management* by Kaipia, Holmström, and Småros (2017) illustrates a joint initiative involving two product manufacturers and a retailer, and identifies responsiveness in production, economizing of attention in the S&OP

Process, and the planning efforts needed in complex scenarios as three key mechanisms in environments where demand fluctuations are rare. S&OP Processes are often rigid, but better results are achieved by adjusting planning efforts to specific needs. For example, the integration of Real-Time Sales Data helped the case study companies adjust their production plans to meet demand, as well as Customer Feedback and Updated Inventory Levels, that refined Production Schedules, especially reducing overproduction and stockouts costs. Additionally, the case study focuses on shared access to Point-of-Sale Data in managing multi-product production under capacity constraints, emphasizing that reduced Lead Times improve management of product introductions, highlighting the need for sufficient integration between Sales and Operations.

However, the value of the integration is not uniform; companies need to consider their specific circumstances—such as customer’s share in volumes and production planning cycles—before investing resources in accessing and analyzing demand data. In scenarios where production capacity is extremely high or low, traditional views suggest that the value of demand information might be limited, but the research of the focus contradicts that view, suggesting substantial benefits even in such conditions.

In conclusion, Data Sharing in S&OP could be tailored to different operational contexts for optimal outcomes, and it is aligned with the need to remain flexible in a dynamic market environment.

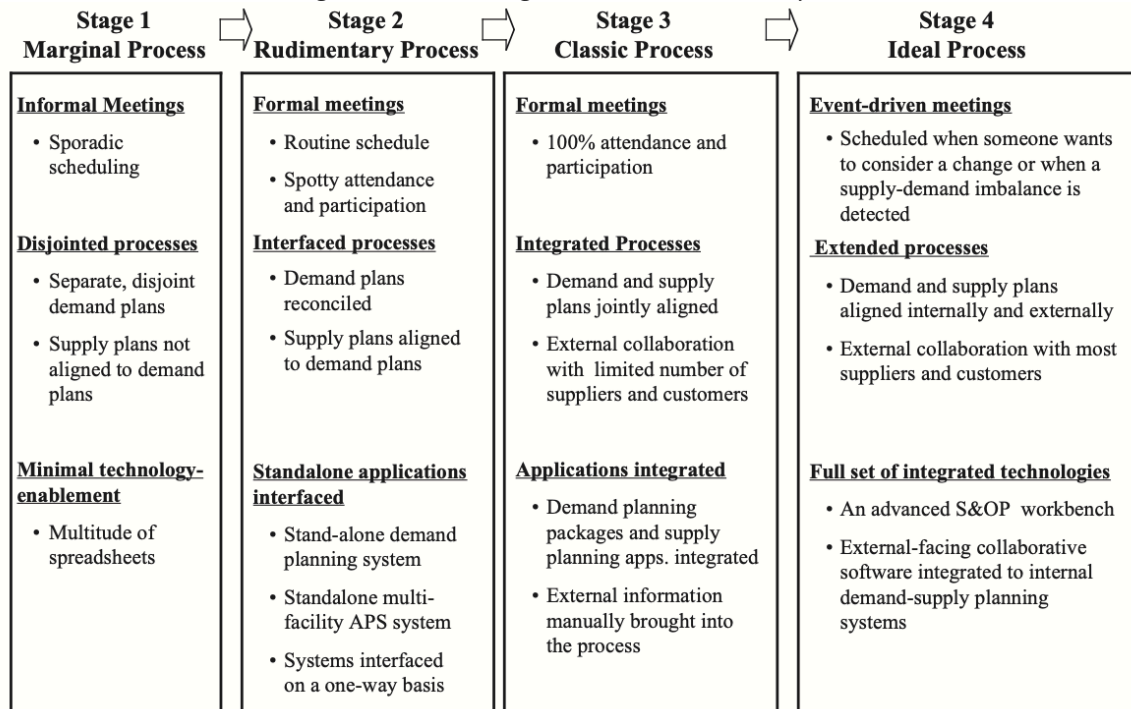
2. MATURITY LEVEL OF THE S&OP PROCESS.

In the article *Sales and Operations Planning Part III: A Diagnostic Model* from the Journal of Business Forecasting (Spring, 2005), frameworks used to evaluate the degree of sophistication and development of an organization processes, generally known as Maturity Models, are presented.

In the context of Sales and Operations Planning, Maturity Models help companies assess their capabilities, identify areas for improvement, and establish a clear path for reaching higher levels of Process Maturity. Not by chance, these Models are able to provide a structured approach to enhance the S&OP Process efficiency, in fact companies understand how to align their practices with Best-In-Class Standards, ensuring better coordination between all the functional areas, finally leading to improved decision-making, higher customer satisfaction, and increased profitability.

The four-stage Maturity Model (see Figure 9) is the one further explained by the expert in Supply Chain Management and Logistic, Larry Lapide.

Figure 9: A Four-Stage S&OP Process Maturity Model



Source: Lapide, 2005

1. At the Marginal Level, S&OP Processes are informal and unstructured. Decisions are made in isolation without cross-functional collaboration, often leading to stockouts or excess inventory. Lack of formal meetings or standardized procedures is often registered, and activities are driven by operational needs rather than strategic goals.
2. In the Rudimentary Stage, organizations begin to develop more structured S&OP Processes, where some collaboration between Sales and Operations is visible, but the process still lacks consistency and formalization, and forecasting is still hand-made. Companies start holding regular meetings but often struggle with maintaining discipline and achieving consensus.
3. The Classic Level shows a more formalized S&OP Process with cross-functional teams. Forecasting Methods are advanced, using historical data and basic analytics to inform decision-making. The implementation of IT systems supports S&OP activities, leading to improved coordination, more reliable inventory management and better alignment with market demand.
4. The Ideal Level represents the pinnacle of S&OP, where the Process is fully integrated across all the functions, and where advanced forecasting techniques, including Artificial Intelligence and Machine Learning, are employed to enhance accuracy. The S&OP Process is proactive, with scenario planning and real-time data driving strategic decisions, and companies are able to quickly adapt to market changes, maintain optimized inventory levels, and achieve high levels of customer satisfaction.

In addition to that, the Aberdeen Group's S&OP Competitive Framework provides another S&OP Maturity baseline, classifying companies as Laggard, Industry Average, and Best-in-Class by studying their process, organization, resource effectiveness, IT architecture, decision making, and collaboration. Best-in-class firms have integrated teams, cross-functional collaboration, and advanced IT systems, emphasizing profit optimization (Elbaum, 2004).

Pyke and Grimson (2007) built on both the Aberdeen Group's S&OP Competitive Framework and Larry Lapide's four-stage S&OP Process Maturity Model, creating an expanded and not so different model, which incorporates five categories — Meetings and Collaboration, Organizational Structure, Performance Measurements, Information Technology, and Plan Integration — evaluated across 5 stages of Maturity (see Figure 10).

1. No S&OP Processes when there are no formal S&OP meetings and the Sales and Operations functions work in silos with minimal or no collaboration.
2. Reactive when the S&OP Processes are basic, but also reactive and primarily driven by immediate needs. Moreover, some meetings take place, but they are often unstructured and lack of consistency.
3. Standard when S&OP Processes are considered more structured and regular, with cross-functional teams and basic IT support. In addition, meetings are scheduled regularly and involve all the key stakeholders.
4. Advanced when S&OP Processes include collaboration, integrated IT systems, and data-driven decision-making. Meetings are well-structured, and everything linked with cross-functional and external collaboration are considered of primary importance.
5. Proactive when the S&OP Process is fully integrated and proactive, using well-developed analytics and real-time data. In particular, meetings are dynamic, involving real-time scenario planning and optimization efforts.

To conclude, the results of Pyke and Grimson's analysis of 15 manufacturing firms suggest that while larger firms and those with high-volume production might slightly correlate with higher S&OP Maturity, strong leadership and well-structured S&OP Processes are crucial enablers. Notably, S&OP integration does not necessarily require advanced technology or large company size but rather effective organizational processes and leadership commitment to ensure S&OP Processes are in place and supported.

Figure 10: S&OP Integration Framework

	Stage 1 No S&OP Processes	Stage 2 Reactive	Stage 3 Standard	Stage 4 Advanced	Stage 5 Proactive
Meetings & Collaboration	• Silo Culture • No meetings • No collaboration	• Discussed at top level management meetings • Focus on financial goals	• Staff Pre-Meetings • Executive S&OP Meetings • Some supplier / customer data	• Supplier & customer data incorporated • Suppliers & customers participate in parts of meetings	• Event driven meetings supersede scheduled meetings • Real-time access to external data
Organization	• No S&OP organization	• No formal S&OP function • Components of S&OP are in other positions	• S&OP function is part of other position: Product Manager, Supply Chain Manager	• Formal S&OP team • Executive participation	• Throughout the organization, S&OP is understood as a tool for optimizing company profit.
Measurements	• No measurements	• Measure how well Operations meets the sales plan	• Stage 2 plus: • Sales measured on forecast accuracy	• Stage 3 plus: • New Product Introduction • S&OP effectiveness	• Stage 4 plus: • Company profitability
Information Technology	• Individual managers keep own spreadsheets • No consolidation of information	• Many spreadsheets • Some consolidation, but done manually	• Centralized information • Revenue or operations planning software	• Batch process • Revenue & operations optimization software – link to ERP but not jointly optimized • S&OP workbench	• Integrated S&OP optimization software • Full interface with ERP, accounting, forecasting • Real-time solver
S&OP Plan Integration	• No formal planning • Operations attempts to meet incoming orders	• Sales plan drives Operations • Top-down process • Capacity utilization dynamics ignored	• Some plan integration • Sequential process in one direction only • Bottom up plans - tempered by business goals	• Plans highly integrated • Concurrent & collaborative process • Constraints applied in both directions	• Seamless integration of plans • Process focuses on profit optimization for whole company

Source: Pyke & Grimson, 2007

3. KEY PERFORMANCE INDICATORS IN THE S&OP PROCESS

According to the article by Pyke and Grimson (2007), the evolution of KPIs across the Five Stages of S&OP Maturity reveals a progression in the presence and sophistication of performance metrics (see Figure 14, row 3: Measurement).

1. In Stage 1, KPIs are practically non-existent beyond standard financial accounting metrics. Operations and Sales departments operate independently, and performance metrics are not systematically aligned with overall goals.
2. In Stage 2, basic KPIs are introduced, primarily measuring how well the Operations department meets the Sales plan. However, accountability for Sales Forecast Accuracy is minimal, and performance metrics are not integrated across functions.
3. In Stage 3, KPIs begin to include measures for both Operations and Sales, such as forecast accuracy, inventory levels, and on-time delivery performance, and these metrics are aligned with company's goals.
4. In Stage 4, KPIs include metrics from Stage 3 and measures for new product introductions and overall S&OP Process effectiveness. The focus is on development cost, time to market, and ramp-up time for new products, with an increased emphasis on collaborative metrics involving key suppliers and customers.
5. In Stage 5, KPIs integrate Profitability. Real-time data access and sophisticated optimization tools are involved, with KPIs centered on profit optimization, supply chain efficiency, and responsiveness to market changes.

Other suitable KPIs for the S&OP Planning environment are usually associated with the order book and production balance, order fulfilment and service level (Stadtler, Kilger, & Meyr, 2015). The following list has been compiled considering various sources on the web to provide a board overview of some essential metrics, each accompanied by its formula and its reference.

- a. Forecast Consumption (%): Core KPI to calculate how much of the forecast is consumed by actual planned orders. It assumes that the actual sales orders consume the forecasted values and helps to separate available Sales Plan from the Orders that are already in the system as customer orders. Consumption can be calculated for different periods and for specific customers (Bishesh, 2022).

$$i. \quad (Total\ actual\ demand - Forecasted\ demand) * 100.$$

- b. Schedule Attainment (%): KPI to measure the ability to execute production according to the plans. Changes in production should always be monitored to find the root cause in case of poor schedule attainment (Lauzier, 2022). In other words, it tracks how

effectively a specific target level of production is attained during a specified time, and it is affected by supplier, internal and customer integration.

Better coordination with suppliers helps to receive materials on time and it could be done by sharing information about company's Demand Forecasts and Production Plans. Moreover, better internal integration helps with transferring information between internal operations, especially regarding new product development and product quality improvement, and might be achieved by adapting Integrated Software Platforms, for example ERP systems. Lastly, Customer Integration may be improved by sharing inventory levels and other information with customers to have better information accuracy regarding their needs (Zhao, Huo, Sun, & Zhao, 2013).

$$ii. \quad \frac{\text{Actual production output in units}}{\text{Target production output in units}} * 100.$$

- c. On Time in Full: KPI that counts on how well the MPS Plans reflect the reality and how efficient and accurate the delivery and logistics are. It consists of two parts; *On Time* refers to production cycle, agreed response time or requested delivery time, and *In Full* refers to customers who receive the same order they asked for (Closser, 2022).

$$iii. \quad \text{On Time in Full} = \frac{\text{Cases matching the criteria}}{\text{Total number of cases}}$$

$$iv. \quad \text{On Time} = \text{Delivery time} - \text{Confirmed delivery time}$$

$$v. \quad \text{In Full} = \text{Delivery amount} - \text{Confirmed amount}$$

- d. Backlog: KPI to compute how much sales orders have been received but not yet produced and/or completed. High backlog often means a high customer demand and financial stability in the future. Low backlog may be a sign of decreasing customer. Some researchers state that a healthy backlog ranges between 1 day to 2 weeks, but however, it varies highly depending on the business. In general, Backlog should be in balance, and an extremely low or high backlog should be avoided (Stadtler, Kilger, & Meyr, 2015). Sales organization should consider the current state of it when promising delivery dates to customers, and it is especially crucial in high demand situations, to achieve as accurate lead-time as possible. (Slotnick & Sobel, 2005).

$$vi. \quad \frac{\text{Total open orders as of measurement day}}{\text{Orders closed per day}}$$

- e. Change in sales order: KPI that follows the number of changes to the existing sales orders. If there is a high degree of change in sales, planning system reactivity should be high enough. If not, it may result in lost sales and excessive finished goods inventories (Stadtler, Kilger, & Meyr, 2015).

$$vii. \quad \frac{\text{Number of order changes}}{\text{Total number of orders}}$$

- f. Adherence to production plan: KPI that considers how effectively production plans are followed, and it is measured with multiple different variables, that include Production, Distribution and Purchasing Plans. The method for measuring Adherence is to compare actuals with the plans, for example Actual Production, to the Production Plans (Oliveira, Azadi Tak, Sousa, & Amin Salimi, 2019).

$$viii. \quad \frac{\text{Scheduled Production} - \text{Actual Production}}{\text{Scheduled Production.}}$$

4. WHAT-IF ANALYSIS IN THE S&OP PROCESS.

Software applications used to analyze raw data, make the company's decision-making process more efficient, reduce costs, uncover opportunities to invest in, and identify processes for potential re-engineering are all part of the broader category of Business Intelligence.

Manual analysis is required by traditional data collection methods, but luckily, BI programs rationalize data extraction, saving time and resources, boosting employee productivity and providing a solid foundation for future forecasts. Despite many benefits, BI faces some technical and cultural challenges, such as reluctance of users to adopt new solutions over traditional ones or navigating through large amounts of irrelevant and low-quality data. Standardized data is the essential building block of the system. Therefore, before extracting information, businesses must ensure their data warehouses are operating at maximum capacity. Companies' lack of understanding of their business processes is another barrier; in fact, this awareness is essential, or else the BI system endeavor may be ineffective (Stedman, 2023). Additionally, firms may develop What-If Scenarios by employing Business Intelligence, a valuable tool when addressing uncertain futures, and even more significant when historical data are lacking or in unstable environments. What-If Scenarios are of two major types:

- a. Projective – Exploratory Scenarios, which are typically based on existing data and provide a forecast that extends from known conditions to a possible future state.
- b. Prospective - Anticipatory Scenarios, which are built on different future visions that may be desired or feared. They involve working backward from a desirable future endpoint to determine its feasibility and the measures to reach it (Ike & Voogd, 2004).

4.1. Methodology for generating What-If Scenarios for Times Series Data.

As studied in Chapter 1, Demand Forecasting techniques and their role in the S&OP Processes have been explored and have set the stage for understanding how businesses optimize their planning strategies to align with market demands. As Chapter 2 delves into the critical success factors and the Key Performance Indicators, it becomes evident that precise and

adaptable Forecasting Methods are essential for the S&OP Process. It is what leads to the purpose of the paper by Kegel, Hahmann, and Lehner (2017), which aims to advance Forecasting Methods by developing a robust Time Series representation capable of generating What-If Scenarios. Specifically, the research proposes a structured approach that involves the following steps: Database, Decomposition, Feature Extraction, Modification, Visualization and Interaction, and Implementation.

1. Data, taken from internal and external sources, are collected in databases. Following collection, cleaning is performed to remove anomalies, missing values, are handled and data are normalized and stored for managing larger volumes of information.
2. Decomposition involves breaking down the time series into its components to study the single elements. Techniques such as Fourier Analysis, Additive and Multiplicative Decomposition, and Machine Learning algorithms are applied, so that the time series is separated into Trend (tr_t), Seasonality ($seas_t$), and Residuals (res_t), as in the formula below (Kegel, Hahman & Lehner, 2017).

$$x_t = tr_t + seas_t + res_t$$

3. Feature extraction focuses on quantifying the attributes identified in the previous step.
 - i. Trend Determination (R^2_{tr}) represents the influence of the trend on the time series and the coefficient is in the below left-hand side formula and ranges from 0 (if the series is determined by the residuals and the influence of the trend is negligible) to 1 (if the trend has a high influence) (Kegel, Hahman & Lehner, 2017).

$$R^2_{tr} = 1 - \frac{var(res_t)}{var(res_t + tr_t)} \qquad tr_t = \theta_1 + \theta_2 * l_t + \delta_t$$

- ii. Trend quantifies the direction of the time series in the long-term and it is expressed through a linear regression as in the above right-hand side formula, where tr_t is the trend value at time t , θ_1 is the intercept, θ_2 is the trend slope, and δ_t is the residual error. In addition, θ_2 indicates the rate and direction of change over time; high slope results in a high increase of the trend whereas a slope near 0 means that there is no overall increase (Kegel, Hahman & Lehner, 2017).
 - iii. Trend Linearity is evaluated using the Coefficient of Determination R^2_{lin} (see the formula below, on the left-hand side) and expresses the relation between the Linear Regression and the Trend. A trend that has little variation, has a strong Linearity, in fact $R^2_{lin}=1$ means that the Trend is a straight line and the Residuals

δt are negligible, otherwise, the Trend fluctuates (Kegel, Hahman & Lehner, 2017).

- iv. Seasonality Determination represents the strength of the Season Component and is through the analysis of periodic components, commonly using Moving Averages, where Seasonality is quantified by subtracting the Trend from the original Time Series and calculating the mean of the Residuals over seasonal intervals. Look at the formula below, on the right-hand side (Kegel, Hahman & Lehner, 2017).

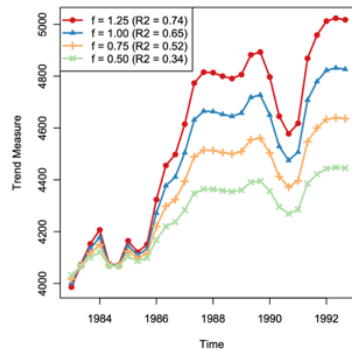
$$R_{lin}^2 = 1 - \frac{var(\delta_t)}{var(tr_t)} \qquad R_{seas}^2 = 1 - \frac{var(res_t)}{var(res_t + seas_t)}$$

- 4. Modification of the upper extracted features allows the creation of What-If Scenarios by applying various hypothetical variable changes. Some of them are listed below (Kegel, Hahman & Lehner, 2017).

- i. To vary the Trend Determination, a factor f is introduced, and the modified Trend $tr_{t,f}$ is defined as in the formula below. It concerns the overall importance of the Trend compared to other factors; if the Trend Determination is high, it means that the Trend has a very strong influence on sales behavior, while if it is lower, it could imply that Seasonality or other fluctuations are more dominant compared to the Trend. Furthermore, Figure 11 is a representative example of how generally factor f influences Trend Determination in different scenarios.

$$tr_{t,f} = \theta_1 + f * (\theta_2 * l_t + \delta_t)$$

Figure 11: Trend Determination Scenarios



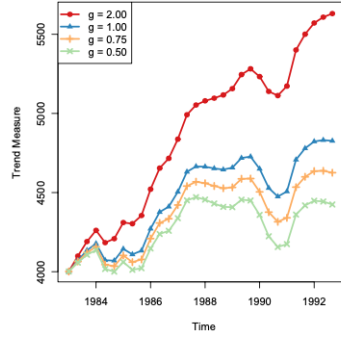
Source: Kegel, Hahmann & Lehner (2017)

- ii. To vary the Trend Slope, a factor g is introduced, and the modified Trend $tr_{t,g}$ is defined as in the formula below. It is about the speed of change of the Trend

itself over time; an increase in the Slope would mean that sales are growing more rapidly, while a decrease in the Slope would indicate slower growth or even a decline. Moreover, Figure 12 is a representative example of how generally factor g influences the Trend Slope in different scenarios.

$$tr_{t,g} = \theta_1 + g * \theta_2 * l_t + \delta$$

Figure 12: Trend Slope Scenarios

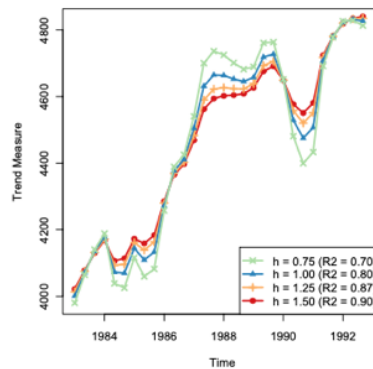


Source: Kegel, Hahmann & Lehner (2017)

- iii. To vary the Trend Linearity, a factor h is introduced, and the modified Trend $tr_{t,h}$ is defined as in the formula below. Varying the Trend Linearity changes how smooth the Sales Trend is; increasing Linearity indicates that Sales follow a more predictable, straight-line path, while decreasing linearity introduces irregularities and deviations from the path itself. In addition, Figure 13 is a representative example of how generally factor h influences Trend Linearity in different scenarios.

$$tr_{t,h} = \theta_1 + \theta_2 * l_t + \frac{1}{h} * \delta$$

Figure 13: Trend Linearity Scenarios

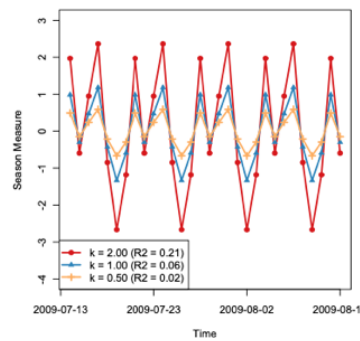


Source: Kegel, Hahmann & Lehner (2017)

- iv. To vary the Seasonality Determination, a factor k is introduced, and the modified Seasonality $seas_{t,k}$ is defined as in the formula below. When Seasonality Determination is varied, the strength of Seasonal Patterns is adjusted; increasing it makes seasonal fluctuations more pronounced, while decreasing it reduces the impact of Seasonality, leading to more consistent sales throughout the year. Additionally, Figure 14 is a representative example of how generally factor k influences Seasonality Determination in different scenarios.

$$seas_{t,k} = k * seas_t$$

Figure 14: Season Determination Scenarios



Source: Kegel, Hahmann & Lehner (2017)

5. Visualization and interaction are essentials for analyzing the What-If Scenarios results. They involve tools such as graphs, dashboards, and advanced visualization software. Interfaces allow analysts to manipulate scenarios in real-time, with the additional possibility of testing hypotheses and immediately discovering the outcomes.
6. The final implementation involves integrating Scenario Generation Process into existing systems, such as ERP, CRM, and SCM. Process automation is achieved by developing automated pipelines for data updates, automatic scenario generation, and alerting decision-makers of significant changes.

4.2. Enhancing S&OP Outcomes through the creation of What-If Scenarios.

By incorporating What-If Scenarios into the S&OP Process, companies have the opportunity to explore the impacts of their strategic decisions in a controlled environment, enabling them to identify the most resilient and effective plans. Organizations' abilities to make informed decisions, optimize resources, and maintain agility in a dynamic market landscape are enhanced. Moreover, What-If Scenarios facilitate collaboration between functions by providing

a common framework for the discussion of potential challenges and opportunities, aligning all departments.

The benefits of What-If Analysis include the managers' ability to adjust assumptions, anticipate the effects of the decisions they are proposing, reduce risks through forecasting decision sales outcomes, and expedite decision-making through real-time data testing. Additionally, it simplifies models by eliminating redundant parts, improves communication, and reduces uncertainty. However, some drawbacks of the process are its resource-intensive nature, requiring significant time and effort, and potential limitations in its accuracy due to reliance on the validity of initial assumptions. The more variables used, the more complex the analysis, the more challenging to manage (Cloud Doing Good, 2024).

Despite these challenges, the integration of What-If Scenarios into the S&OP Process not only improves forecast accuracy but also strengthens the organization's ability to respond to unforeseen events, contributing to sustained competitive advantage and operational excellence, especially in an ever the today's evolving business environment (Önkal, Sayım & Gönül, 2013).

5. STRATEGIC CONSENSUS IN THE S&OP PROCESS.

"The shared understanding of strategic priorities among managers at the top, middle, and/or operating levels of the organization" is defined as *Strategic Consensus* (Kellermanns, Walter, Floyd, Lechner, & Shaw, 2011).

5.1. Methodology for computing Within and Between Groups Strategic Consensus.

It has long been recognized as an important literature concept for the facilitation of communication, coordination, and alignment of actions towards common organizational goals. Despite the recognized importance, research has primarily focused on the degree of agreement within groups, often neglecting the content of the consensus between groups, and the significance of differences in consensus. To address these limitations, Tarakci et al. (2014) propose Strategic Consensus Mapping (SCM), an exhaustive study of the concept both within and between groups, enabling a multidimensional and longitudinal analysis.

In particular, SCM employs a set of complementary procedures, such as:

- a. Vector Model for Unfolding (VMU) to measure and visualize the Within-Group Strategic Consensus. It provides a joint-space representation where strategic priorities and respondents' preferences are plotted. The angle between vectors represents the similarity of respondents' opinions, and the spread of vectors indicates the degree of

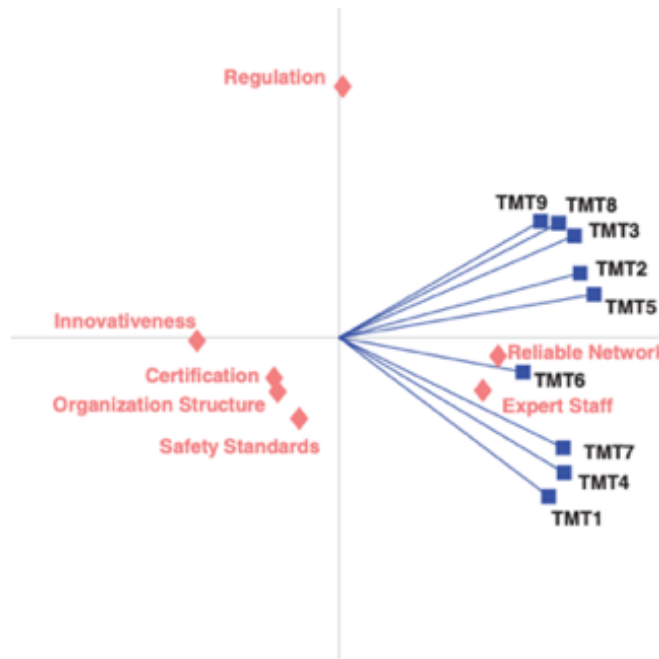
Within-Group Consensus. The objective is to minimize the sum of the squared errors $\|E\|^2$ for H and the low-dimensional representation XA' ; below the formula that is further explained in the following pages, also with the help of Figures 15 and 16.

$$L_{VMU}(X, A) = \|H - XA'\|^2 = \sum_{ij} e_{ij}^2$$

H is a matrix representing the input data, with rows corresponding to strategic priorities and columns corresponding to respondents ($TMT_1, TMT_2, TMT_3, \dots$). Principal Component Analysis (PCA) is performed on H to derive two matrices: X and A . The former is an $m \times p$ matrix representing the scores of the strategic priorities, while A is an $n \times p$ matrix representing the loadings of the respondents. Using the matrices, a biplot is created where the points, derived from X , represent the Strategic Priorities, and the vectors, derived from A , represent the Respondents' Preferences.

Furthermore, to understand better, Figure 29 is an example of a VMU visual representation biplot for the Top Management Team after a half-day strategic intervention. The vectors represent individual TMT members and the projections of the strategy items onto these vectors show their revised strategic priorities, after the intervention. The vectors are more closely clustered together compared to the starting point, indicating an increased degree of Within-Group Consensus (α post-intervention is higher than pre-intervention, $\alpha_{pre}=0.55, \alpha_{post}=0.81$) (see point b, to understand α).

Figure 15: VMU biplot for the TMT after intervention ($\alpha=0.81$)



Source: Tarakci et al., 2014

Figure 16: Data matrix of the VMU biplot before intervention ($\alpha=0.55$)

Strategic priority	Respondent								
	TMT1	TMT2	TMT3	TMT4	TMT5	TMT6	TMT7	TMT8	TMT9
Safety	1	2	3	2	5	6	4	7	5
Certification	4	1	4	3	6	5	5	2	7
Expert Staff	7	6	7	7	7	4	7	3	6
Regulation	6	7	5	6	1	2	3	1	2
Reliable Network	5	3	6	5	3	7	6	6	3
Organizational Structure	3	5	2	4	4	3	1	4	4
Innovativeness	2	4	1	1	2	1	2	5	1

Source: Tarakci et al., 2014

To conclude, Figure 30 presents the applied data matrix (H) of the VMU biplot before the intervention ($\alpha_{pre}=0.55$), where the higher the numbers of the scale 1-7 (with no repetition) the higher the prioritization of strategic priorities given by each TMT member.

- b. To numerically assess the Degree of Within-Group Strategic Consensus, a new measure denoted as α has been created and represents the length of the average component loading vectors of the VMU solution:

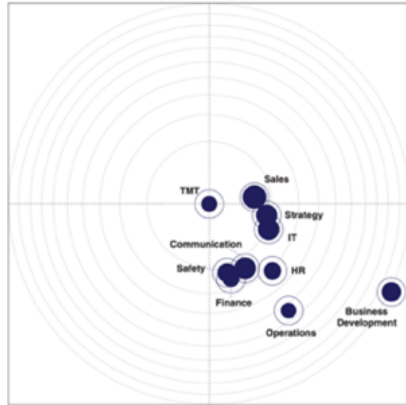
$$\alpha = \sqrt{\sum_{p=1}^2 \left(\frac{1}{m-1} \sum_i a_{ip} \right)^2}$$

where a_{ip} is the p -th component loading for respondent i . The α ranges 0-1 and it cannot be directly defined as the angle between the TMT vectors. Instead, it is an aggregate measure that quantifies the overall degree of Within-Group Strategic Consensus by considering the positions and orientations of all the vectors in the multidimensional space, reflecting how tightly clustered or dispersed the respondents' preferences are.

- c. Multi-Dimensional Scaling (MDS) to visualize the Between-Group Strategic Consensus. Each bubble represents a group, such as the TMT or various functional departments, and the position of the bubble's center indicates how closely that group aligns with the TMT strategic priorities. Bubbles closer to the center (TMT bubble) demonstrate a higher alignment with the TMT strategic priorities. The size of each bubble reflects the level of Within-Group Consensus; larger blue bubbles indicate higher internal consensus. Groups with larger blue bubbles near the center are both well-aligned with the TMT and have high internal consensus. Conversely, smaller blue bubbles, even if close to the TMT, suggest lower internal consensus. Moreover, the light grey rings surrounding the TMT represent the correlations between each group and the

TMT, indicating how closely each group's strategic priorities are in line with those of the TMT. Look at Figure 17 to have a practical example.

Figure 17: MDS Solution Depicting the Degree of Between-Group Consensus



Source: Tarakci et al., 2014

Sales and Strategy are near the TMT, indicating strong alignment, and their large bubble sizes suggest high internal consensus. In contrast, Operations and Business Development show less alignment with the TMT and their smaller bubble sizes reflect lower internal consensus.

- d. Permutation Testing is employed to assess the statistical significance of differences in Strategic Consensus, both cross-sectional and longitudinal. The nonparametric method tests the null hypothesis (H_0) by comparing observed values with values obtained from randomly permuted datasets. For example, to confirm the effectiveness of the intervention shown by Figure 15, it has been verified whether the increase in the α value was statistically significant. The results showed that it was at the 5% level ($p = 0.04$), confirming that the intervention was successful in improving internal consensus.

5.2. Enhancing S&OP Outcomes through the improvement of Strategic Consensus.

In the context of the current research, it is essential to link Strategic Consensus to the S&OP Process. Strategic Consensus among management levels is crucial for the success of S&OP, as alignment on the organization's key goals enhances communication and coordination across departments, reducing conflicting priorities and fostering a collaborative environment.

Kenneth and Christopher (1999), in their article *Strategic Consensus in Operations Strategy* published in the *Journal of Operations Management*, argue that the absence of consensus leads to fragmented decision-making, with each department pursuing divergent goals that undermine S&OP effectiveness. Studies show that organizations with high Strategic Consensus optimize supply chain activities, avoid production delays, and respond more effectively to market shifts (Boyer & McDermott, 1999).

A more comprehensive explanation on the topic is provided in Chapter 4.

6. STRATEGIC CONSENSUS AS RESEARCH FOCUS AND CONCLUSIONS.

In conclusion, the Sales and Operations Planning (S&OP) Process serves as a critical tool for aligning operational capacities with broader strategic goals. The focus has been on exploring the key aspects of the S&OP Process itself, including the Structured 5-Step Approach, the S&OP of success factors, the great role played by information sharing, and the use of What-If Scenarios to better react to everchanging market conditions. Do not forget Strategic Consensus, which is one of the two primary focuses of the research, playing a crucial role in improving communication and coordination, and in promoting alignment. Anyway, achieving a high level of agreement within and between teams is vital to ensuring alignment with the company's overarching goals, leading to more informed decision-making, operational coherence, and competitive advantage. The current Chapter has also introduced several analytical models, such as the Vector Model for Unfolding (VMU) and Multi-Dimensional Scaling (MDS), which help measure and visualize both Within-Group and Between-Group Strategic Consensus and provide valuable insights into the degree of alignment between the Top Management Team and other functional groups, contributing to the later on empirical analysis. Additionally, the discussion around S&OP Maturity Models has emphasized the importance of advancing and more developed S&OP Practices, showing how fundamental is moving from basic collaboration to fully integrated, data-driven processes.

Finally, in Chapter 4, a detailed analytical analysis of Strategic Consensus and S&OP Maturity is carried out. Using the methodologies just discussed, Dafram S.p.A. will be finally able to assess the alignment within its TMT, with Alpha calculations serving as focal metric. The findings will not only highlight the current state of alignment of the company but also offer practical recommendations to improve Strategic Coordination and overall S&OP Performance.

CHAPTER 3 – DAFRAM S.P.A. & QUESTIONNAIRES TO ASSESS S&OP MATURITY AND STRATEGIC CONSENSUS

INTRODUCTION TO THE CHAPTER.

The chapter focuses on the company Dafram S.p.A., a prominent Italian valve manufacturer, with the goal of evaluating its Sales and Operations Planning (S&OP) Process Maturity and the level of Strategic Consensus within its Management Team, being conscious of the demonstrated relevance of the concepts for the achievement of the long-term organizational goals.

A custom questionnaire containing opened and closed questions has been designed by the Business and Economic Sciences Department of the University of Padova and appears in a unique document, divided into two sections: one assessing the level S&OP Process Maturity, and the other focusing on the degree of Strategic Consensus.

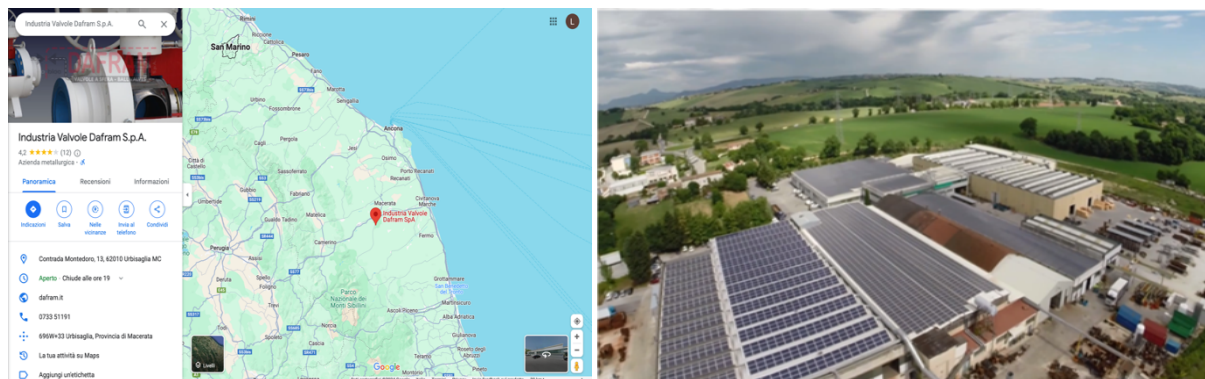
In addition to further outlining Dafram S.p.A.'s way of thinking and organizing itself, the Chapter clearly explains the structure of the questionnaire going through the different subsection questions of each section, shows the members of the TMT who have been asked to fill the forms and finally the methodology employed to assess the results, to reach some conclusions and to propose some recommendations.

1. DAFRAM SPA – COMPANY PROFILE.

1.1. Brief Introduction of the company and its production process.

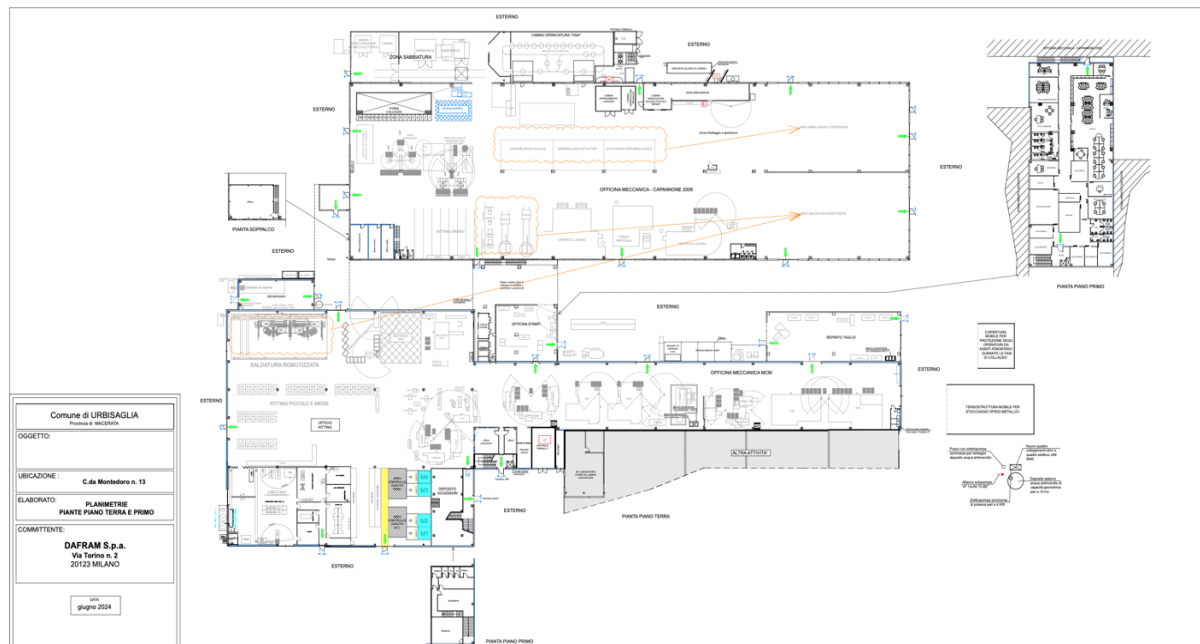
Dafram S.p.A., founded in 1956, is an Italian company that has established itself as a pioneer in the valve manufacturing industry. It is considered one of the first to produce ball valves with the PTFE seats. The old and green town called Urbisaglia (MC) known for the Roman ruins, in the Marche region of central Italy, hosts its headquarter and its production facilities. In particular, the industrial complex spans 33,600 square meters (see Figure 18), with 12,000 square meters dedicated to manufacturing (see Figure 19), which consists of a modern workshop, testing center, technical offices, and a variety of production activities that enable Dafram to maintain full in-house control over the entire production process, from design phase to final testing moment.

Figure 18: Overhead View of Dafram S.p.A.



Source: Dafram S.p.A

Figure 19: Site Plan of Dafram S.p.A. Plant – Ground and First Floor



Source: Dafram S.p.A

Ball valves are used for the interception, diversion or the regulation of fluids in virtually all chemical plants, petrochemicals, refineries, in power generation and domestic plants. In Dafram S.p.A specific case, Oil & Gas, Chemical Processing, and Pharmaceuticals are the main industries that are involved in the high-performance sector for which the company operates. Its valves are designed to operate reliably in challenging environments, including cryogenic applications and high-temperature services.

Ball valves are so called because their main component is a sphere with a hole which rotates on an axis perpendicular to the fluid flow. Generally speaking, the main components of which they are made up of are:

- a. Body: the outer part which includes all other components.

- b. Shutter: a perforated sphere that rotates on an axis perpendicular to the flow of fluid.
- c. Stem: it connects the shutter to the handle and allows rotation.
- d. Gaskets: it ensures the leak tightness between the shutter and the valve body, preventing fluid leakage.
- e. Handle: it allows to turn the stem and consequently the shutter, opening or closing the valve.

By rotating the handle 90 degrees, the valve opens as the ball's hole aligns with the flow of the fluid, allowing it to pass through. To close the valve, the handle is turned another 90 degrees, rotating the ball once more to block the fluid's passage. Thanks to the straightforward mechanism, ball valves are considered to be intuitive and quick to use.

To have a practical example, shown below are various valves I had the great opportunity to observe during one of my visits to the company. As it can be evidently seen, they come in different sizes, with some being taller than both me and the employee.

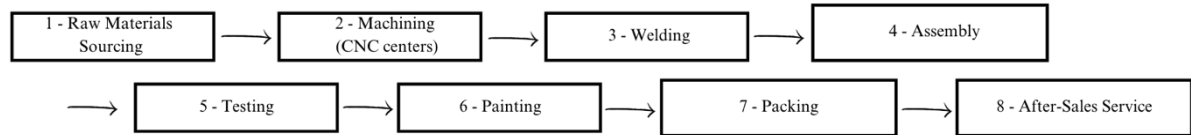
Figure 20: Examples of Various Valve Sizes at Dafram S.p.A. Production Facility



Source: Dafram S.p.A

In addition to the machining centers, Dafram’s capabilities extend to several processes (see Figure 21), including Welding, Assembly, Testing, Painting, Packing, and After-Sales Service, making the company a fully integrated manufacturer.

Figure 21: Sequential Overview of Dafram’s Valve Production Process



Source: Dafram S.p.A

1. Dafram’s machining activities are supported by the use of Western European-sourced raw materials, which include forgings, rolled bars, forged bars, and castings.
2. The company operates state-of-the-art Multi-Function CNC Machining Centers, which are employed for boring, turning, drilling, and tapping valve bodies (see Figures 22, 23, and 24), and perform critical processes on both the valve bodies and components (see Figure 25).
3. With over 50 different welding procedures (PQR), including SMAW, GTAW, and GMAW techniques, Dafram ensures that its welding processes are reliable and adaptable to various requirements.
4. Machined and welded components are then moved to the assembly stage, where valves of different sizes—up to 12 inches, 24 inches, and beyond—are assembled in bays.
5. Dafram’s testing capabilities are also extensive, with equipment and testing bunkers designed for endurance, cryogenic, high-temperature, hyperbaric, and wear testing. The testing equipment includes hydraulic and gas test benches capable of testing pressures up to 1,600 bar and 1,350 bar, respectively. Additionally, Dafram performs helium testing, fugitive emission monitoring, and cryogenic testing on valves up to 36 inches in diameter, alongside customized tests to meet customer specifications.
6. Dafram’s painting facilities operate over 180 different procedures, with the ability to handle components weighing up to 44 tons. The personnel are certified to NACE CIP level 3, ensuring that dry film thickness, adhesion, and chemical tests are performed to the highest standards.
7. Packing is also conducted in-house.
8. Finally, the After-Sales Service, which includes maintenance, overhaul, and restoration of heavily worn valves, enabling customers to maximize the products lifespan.

Figure 22: M.C.M Machining Centre for valves up to 30"



Source: Dafram S.p.A

Figure 25: Mori Seiki



Source: Dafram S.p.A

Figure 23: M.C.M. Machining centre for valves up to 24"



Source: Dafram S.p.A

Figure 26: Padovani C.N.C. lathe



Source: Dafram S.p.A

Figure 24: Trevisan Machining Centre



Source: Dafram S.p.A

Figure 27: PBR C.N.C. lathe



Source: Dafram S.p.A

1.2. The 7 core strategic priorities of the company.

In the context of the already underlined significance of Strategic Consensus, General Manager Nicola Chiavari and the Sales Manager Armando Spaccasassi have outlined Dafram S.p.A.'s 7 strategic priorities, which reflect the company's core values (see Figure 28). The contents of the article by Tarakci et al. (2014) are applied and everything is well explained later on.

Figure 28: Core Strategic Priorities of Dafram S.p.A

STRATEGIC PRIORITIES	
1	Safety
2	Expert Staff
3	Strategic Partnerships - Reliable Network
4	Economic Reliability of Products/Processes
5	Organizational Structure
6	Risk Management
7	Enviromental Sustainability

Source: Dafram S.p.A

- a. Safety concerns both the safety of facilities and machinery, ensuring a secure working environment, and the safety of the products themselves. Given that the company manufactures products intended for the transportation of Gas & Oil (among other uses), rigorous safety checks are essential. Most of the inspections are conducted internally, while sometimes external audits are carried out by third-party companies.
- b. Expert Staff because operators and employees are provided with a period of mentorship, primarily to master a specific task, but in some cases to develop greater flexibility across multiple roles. New workers on the production floor are generally paired with more experienced colleagues, while office staff are either mentored by professionals or sent to pursue master's programs, to broaden knowledge and skills.
- c. Strategic Partnerships emphasize how important is building strong, trustworthy relationships with both customers and suppliers. Such partnerships ensure confidence not only in the quality of the products supplied and sold but also, in the case of suppliers, in gaining access to potential discounts, promotions, or any other valuable business network characteristic.
- d. Economic Reliability of Products and Processes focuses on the insurance that both the products and the processes are cost-effective, efficient, and reliable over time. It emphasizes maintaining high-quality standards while minimizing production costs and reducing inventory levels. Lower inventory means not only reduced inventory costs but also the ability to identify potential problems earlier in the production process.
- e. Organizational Structure means making it as flexible and streamlined as possible, recognizing its importance, particularly given the company's application of Lean principles since 2012. It involves producing in the smallest possible batches and striving to eliminate all forms of waste, including unnecessary motion or overprocessing.
- f. Risk Management focuses on being ready to handle any eventuality, so that the company responds effectively to unforeseen challenges. It involves having a well-trained workforce, capable of solving issues quickly and intelligently, minimizing disruptions and defects.
- g. Environmental Sustainability underscores the growing significance of the theme in today's industrial landscape. Dafram is committed to reducing its environmental impact and has obtained several certifications, including ISO 14001, which focuses on environmental management. The company's installation of photovoltaic panels in 2008 stands as a key example of its dedication to generating clean energy.

1.3. Financial Performance of the company.

Figure 29 presents the Financial Performance of Dafram S.p.A of the last 5 available years, with a generally positive trend, especially in the fiscal year 2023. The following analysis highlights areas where the company has shown improvement, as well as potential areas for concern or opportunities for further growth.

Figure 29: Dafram S.p.A. Key Financials and Ratios (2019-2023)

Key Financials	2023	2022	2021	2020	2019
Total Revenues	39.291.247,00 €	27.627.855,00 €	24.858.295,00 €	37.430.754,00 €	33.171.570,00 €
EBITDA	5.931.668,00 €	2.504.229,00 €	1.903.029,00 €	4.331.224,00 €	2.207.652,00 €
Net Income	2.652.574,00 €	362.035,00 €	600.671,00 €	2.099.913,00 €	761.576,00 €
Total Assets	55.012.232,00 €	44.069.813,00 €	42.204.007,00 €	39.500.637,00 €	39.374.389,00 €
Equity	15.993.081,00 €	13.490.173,00 €	13.116.849,00 €	12.913.780,00 €	10.411.322,00 €
NFP	- 780.962,00 €	- 2.540.514,00 €	- 3.960.552,00 €	- 601.663,00 €	- 1.950.204,00 €
Number of Employees	126	129	143	137	134

Key Financial Ratios	2023	2022	2021	2020	2019
EBITDA/Revenues	14,63%	8,50%	7,40%	11,36%	6,50%
ROA	9,22%	3,80%	2,56%	9,41%	3,33%
ROE	16,59%	2,68%	4,58%	16,26%	7,31%
Debt/Equity	0,75	0,99	1,03	0,67	1,01
Debt/EBITDA	2,02	5,31	7,11	2	4,76

Source: Dafram S.p.A

First, let's focus on some positive aspects:

- Total Revenues (+42,25%):** In 2023, Dafram achieved €39.29 million in total revenues, registering a substantial increase with respect to the €27.62 million in 2022. 42,25% of growth year-over-year can be considered an indicator of increased demand for products, successful market expansion, and/or improved operational efficiency.
- EBITDA (+137,2%):** The EBITDA grew in 2023 to €5.93 million, with respect to €2.50 million in 2022. The EBITDA/Revenue ratio increased to 14.63%, showing the improved operational efficiency, leading also to higher profitability at the operating level (+72,12%). The jump from 8.5% in 2022 to 14.63% in 2023 reflects better cost control, higher sales volumes, and/or a more favorable product mix.
- Net Income (+632,69%):** Dafram's Net Income increased dramatically to €2.65 million in 2023 from just €362,035 in 2022, and it is an indicator of the ability to convert operational efficiency and revenue growth into bottom-line profit.
- Profitability Ratios (ROA and ROE) (+142,63_+519,03%):** Dafram's Return on Assets (ROA) jumped from 3.80% in 2022 to 9.22% in 2023, showing the improved ability to generate profit from its asset base.

The Return on Equity (ROE) also saw an improvement, from 2.68% in 2022 to 16.59% in 2023, which is considered strong, showing that the company is efficiently using equity to generate profits.

- e. Debt Management (-32%): The Debt-to-Equity ratio decreased to 0.75 in 2023, from 0.99 in 2022, indicating the reduced reliance on debt financing relative to equity. A ratio below 1 is considered healthy, as it means the company is not excessively leveraged. Additionally, the Debt/EBITDA ratio improved, falling to 2.02 in 2023 from 5.31 in 2022, and it indicates that debt is much more manageable in relation to its earnings, as it would take just over two years of EBITDA to cover its debt obligations.

Second, let's focus on some areas for improvement:

- a. EBITDA and Profitability: While the 2023 results are very promising, the fluctuations in EBITDA over the past few years highlight a period of volatility. Though 2023 represents a high point, it is crucial for Dafram to maintain this level of operational efficiency in the coming years.
- b. Net Financial Position: The NFP shows an improvement from €2.54 million in 2022 to €780,962 in 2023, indicating a reduction in net debt, but Dafram could still consider strategies to reduce debt further (or improve its liquidity) to ensure a future stable NFP.
- c. Employee Base: While Dafram's workforce has slightly decreased from 126 employees in 2023 compared to 129 in 2022, it remains significantly lower than in 2021 (143 employees) and 2020 (137 employees). However, given the growth in revenue over the same period, the reduction in staffing might signal a potential need for reinvestment in human capital to sustain future growth.

1.4. Most insightful KPIs of the company.

A key metric used to assess the efficiency of Dafram S.p.A.'s production facilities is the Overall Equipment Effectiveness (OEE), the gold standard for measuring manufacturing productivity, calculated by multiplying the Availability Rate (a), the Performance Rate (p), and the Quality Rate (q).

- a. The Availability Rate measures how much of the Available Operating Time for equipment is actually used for Production. Losses in Availability include unplanned downtimes, periods of no demand, and setup times, which, if not managed properly, significantly reduce the Total Operating Time.

- b. The Performance Rate refers to how fast the equipment operates compared to its maximum capacity. Slower production speeds due to poor maintenance or not well-trained employees' inefficiencies lower the rate.
- c. The Quality Rate shows the percentage of products that meet quality standards without requiring rework or being discarded. Defects or quality inspections reduce the rate and thus lower the overall OEE score.

$$\text{Overall Equipment Effectiveness (\%)} = a \times p \times q$$

In the language of OEE that means 100% Quality (only Good Parts), 100% Performance (as fast as possible), and 100% Availability (no Stop Time).

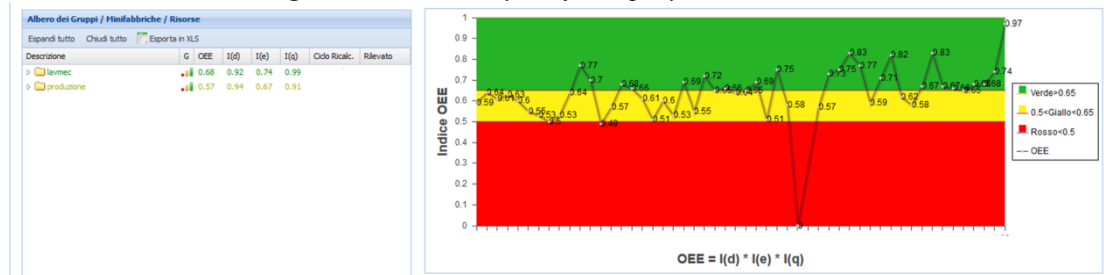
The starting point is the computation of the Loading Time (also called Available Operating Time), from which the Availability Losses, such as Set-Up Times and Breakdowns, are subtracted to reach the Total Operating Time, from which the Performance Losses, like Poor Maintenance and Lack of Training, are subtracted to reach the Net Operating Time, from which Quality Losses, as Defected Products, are subtracted to reach the Valuable Operating Time.

$$a = \frac{\text{Total Operating Time}}{\text{Loading Time}} \quad p = \frac{\text{Net Operating Time}}{\text{Total Operating Time}} \quad q = \frac{\text{Valuable Operating Time}}{\text{Net Operating Time}}$$

The Dafram S.p.A. company's OEE data is segmented at a Company-Wide Level, with a specific focus on the Mechanical Processing and on Production. In all the three cases, it is notable a drop to 0 in August, and it is associated to summer holidays.

- a. Company-wide OEE (see Figure 30) shows the entire production chain efficiency, and fluctuates throughout the considered period, with noticeable drops in the first phase where values fell below 0.5, entering the red zone. Despite drops, the index showed a recovery in the subsequent weeks, frequently surpassing the 0.65 threshold, also reaching a peak of 0.97. However, points of improvement remain, particularly in the column labeled I(e) (Performance), which displays lower values compared to Availability (I(d)) and Quality (I(q)). Lower values might be attributed to factors such as maintenance issues, inadequate operator training, or to the increased workload caused by a higher volume of orders, which could place additional stress on production resources, leading to delays, equipment inefficiencies, or overloaded resources.

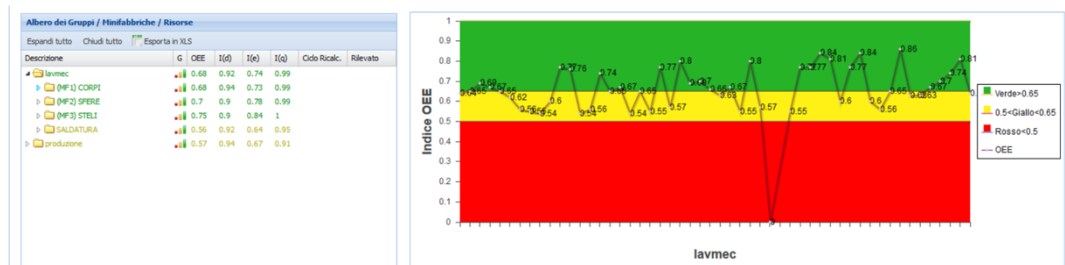
Figure 30: Trend Analysis of Company-wide OEE



Source: Dafram S.p.A

- b. OEE for Mechanical Processing (see Figure 31) focuses on the CNC Machines Efficiency and remains predominantly in the yellow and green zones, with no drops into the red zone. The lowest recorded OEE touches 0.54, but still remains within the yellow zone. Anyway, there are several peaks where the index surpasses 0.8. Despite occasional fluctuations, the mechanical processing operations have maintained satisfactory performance. As demonstrated in previous sections, the Performance Index I(e) remains consistently lower compared to Availability (I(d)) and Quality (I(q)), and it indicates that while the division performs well in terms of Availability and Quality, there are still some challenges related to operational performance, again possibly linked to workload fluctuations, equipment downtime, or training gaps.

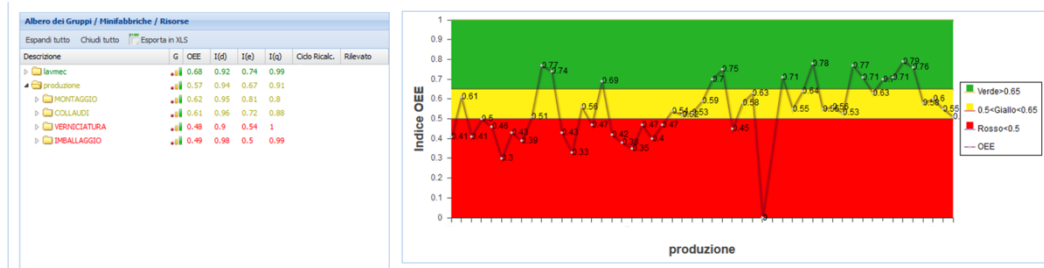
Figure 31: Trend Analysis of OEE for Mechanical Processing



Source: Dafram S.p.A

- c. OEE for Production (see Figure 32) tracks the efficiency for the Production Department. It fluctuates significantly, with multiple periods where the index dips into the red zone, also reaching values such as 0.30 and 0.33. However, there are also notable improvements, with the OEE reaching peaks at almost 0.80. As already observed, the Performance Index I(e) remains the weakest component compared to Availability (I(d)) and Quality (I(q)), suggesting that the main challenge in maintaining a higher OEE lies in Performance.

Figure 32: Trend Analysis of OEE for Production

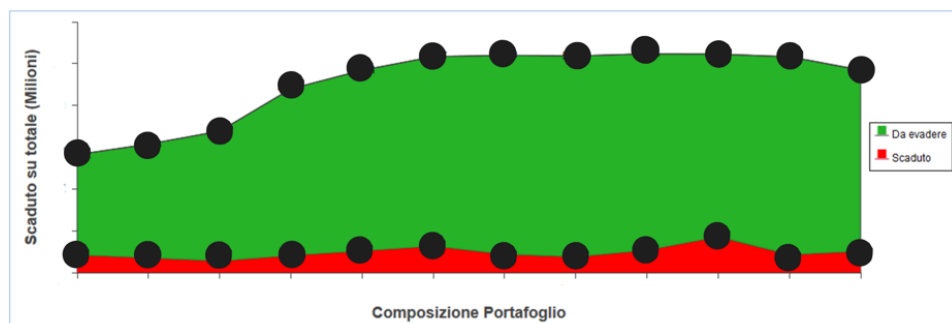


Source: Dafram S.p.A

Besides OEE, other Key Performance Indicators are crucial to gain a complete understanding of Dafram S.p.A.'s S&OP Process Performance. Here is a concrete list of some of them practically applied, and which are useful for the cross-analysis of the end paragraph. Results are shown in the form of graphs and percentages to have an idea but are not complete and 100% comprehensive, because data is sensible, in most of the cases. In details:

- d. Overdue Orders measures the number of orders not fulfilled by the agreed delivery date. It is visible an increase in the volume of Orders to be fulfilled (green zone), reaching its peak during the former half of the period and remaining stable during the latter half. On the other hand, a small rise in Overdue Orders occurs toward the final quarter, suggesting potential delays or bottlenecks in the order fulfillment process. (The black circles of the graph serve to obscure the value amounts of Orders to maintain sensitive information private).

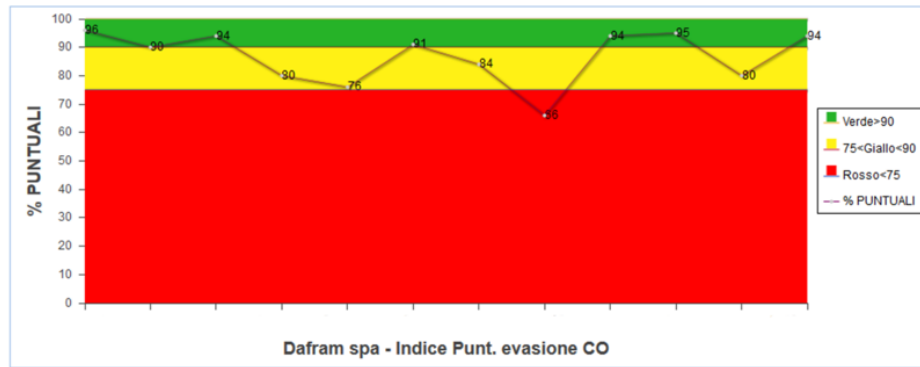
Figure 33: Order Portfolio Breakdown: Overdue vs. Pending



Source: Dafram S.p.A

- e. On-Time Delivery (OTD) measures the percentage of orders delivered On Time. The graph is divided into three color-coded zones: green (above 90% punctuality), yellow (between 75% and 90%), and red (below 75%). At the beginning, Punctuality is high, consistently within the green zone. However, the following period is characterized by a decline, with punctuality dropping into the yellow and even red zones. At the end, the company shows a recovery, with Punctuality improving back into the green zone.

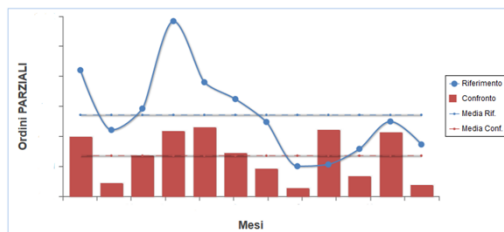
Figure 34: %OTD Trends



Source: Dafram S.p.A

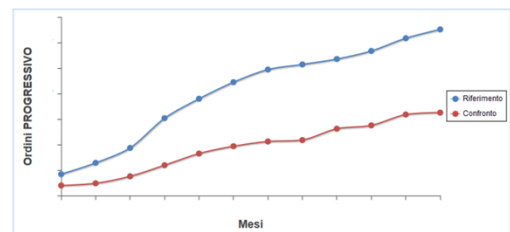
- f. Order Trends track the volume of Partial (see Figure 35) and Cumulative Orders (see Figure 36) throughout (see “Riferimento” line) and compared to the previous period (see “Confronto” line). In the first graph, it is clear that the volume of orders in almost every month is significantly higher than that of the previous year. The second graph highlights an even more striking difference, because, as the months progress, the cumulative total of orders far exceeds that of the previous period. The gap between the two widens, demonstrating a significant growth in demand, suggesting favorable market conditions or improved company performance in attracting and processing orders.

Figure 35: Monthly Partial Orders:
Reference vs. Comparison



Source: Dafram S.p.A

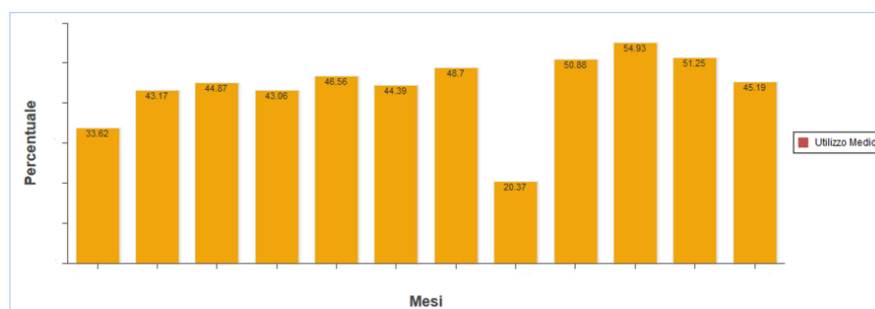
Figure 36: Cumulative Order Trends:
Reference vs. Comparison



Source: Dafram S.p.A

- g. Average Resource Utilization measures the percentage of time a resource is actively used compared to its total available time. It fluctuates, showing periods of both growth and decline. After the holidays dip represented by the smallest column, Resource Utilization recovers, reaching its highest levels towards the latter part of the year. Overall, the Resource Utilization remains relatively balanced, with a few months showing higher levels of activity and others with lower utilization, reflecting the dynamic nature of operational demand and resource allocation.

Figure 37: Average Resource Utilization by Month



Source: Dafram S.p.A

To conclude, the analyzed KPIs are crucial for assessing the Performance of Dafram S.p.A.'s Sales and Operations Planning Process. Indicators have been analyzed without explicitly stating the specific dates or amounts to safeguard sensitive business information. Moreover, the time period for all KPIs is consistent, allowing for a meaningful comparison. Below a discussion of how the metrics might interconnect and reveal key insights.

a. Interconnection between OEE and Resource Utilization.

The OEE data, segmented by Company-Wide, Mechanical Processing, and Production departments, shows distinct variations in performance across the different areas. The same dips in OEE observed, correspond to periods of lower Resource Utilization, and the key takeaway is that the company's ability to maintain a high OEE score is largely dependent on effective Resource Utilization, because when resources are underutilized, it directly impacts the performance component of OEE (I(e)).

Enhancing resource planning and utilization, possibly through better alignment with demand fluctuations, could help mitigate the dips in OEE performance, especially in critical operational periods.

b. Impact of Order Trends on OEE and Overdue Orders.

The analysis of Order Trends reveals that the most recent chosen period saw a considerable increase in incoming order volumes compared to the previous one. It surge in demand likely put additional pressure on the company's production processes, which is reflected in occasional dips in the OEE's Performance component.

Despite it, Dafram S.p.A. has been able to recover and successfully face the situation, as evidenced by the improvement in OTD Index, but the ongoing increase in order volume, alongside the fluctuating OEE, suggests that the company may be approaching its capacity limits. To sustain growth, further refinement in production scheduling and resource allocation will be necessary to avoid overloading systems and ensure timely order fulfillment.

c. Order Fulfillment and On-Time Delivery.

The OTD metric reveals a strong start in terms of On-Time Deliveries, but there is a decline as time progresses, which may correlate with the rise in Overdue Orders and the overall increase in demand, suggesting that the company's capacity to meet delivery deadlines have been challenged by the volume of incoming orders. By the final months of the year, Dafram S.p.A. had recovered Punctuality, bringing the OTD back to the green zone. It indicates that while the company has faced challenges in balancing high demand with production capacity, it has been able to implement corrective actions effectively.

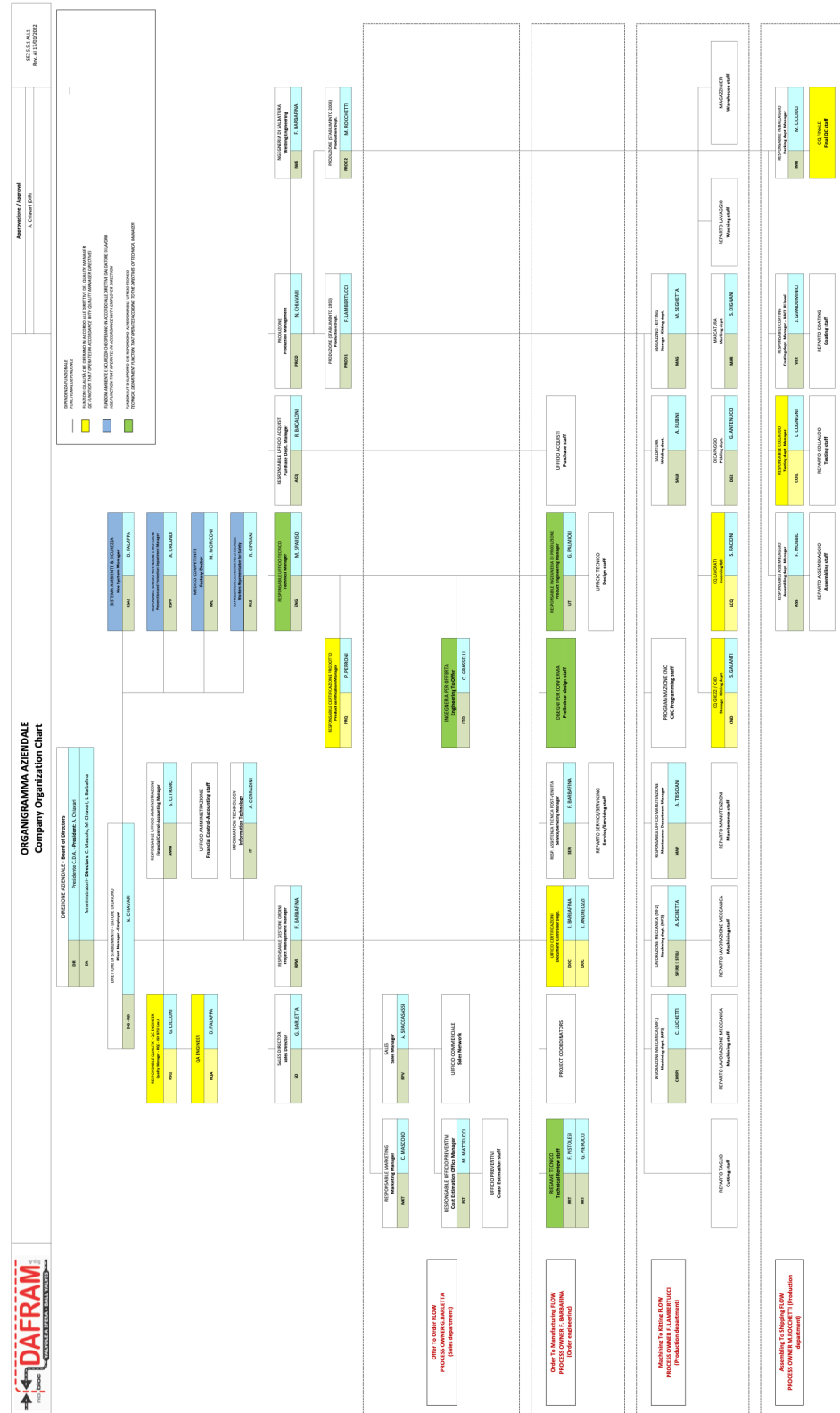
d. Insights from Cross-Analyzing OEE, Orders, and Resource Utilization.

The growth in Order Volume and the fluctuations in OEE highlight the operational strain caused by increased demand. The periods of high Resource Utilization often coincide with higher OEE scores, confirming that efficient resource management plays a role in maintaining production performance. Conversely, when Resource Utilization drops, either due to lower demand periods or operational inefficiencies, OEE scores also decline, indicating a direct relationship.

To sum up, the cross-analysis of the KPIs reveals several strategic steps for Dafram S.p.A.:

- a. Optimizing Operational Performance: The I(e) component of OEE presents the greatest opportunity for improvement. A focus on optimizing equipment performance, refining production scheduling, and enhancing workforce training and maintenance protocols might contribute to a more efficient operational flow.
- b. Strengthening Capacity Management: The rising volume of orders underscores the importance of a more sophisticated approach. Ensuring that production resources are effectively aligned with growing demand is essential in maintaining high OEE and OTD levels, avoiding production bottlenecks and delays.
- c. Maximizing Resource Utilization: During periods of fluctuating demand, it is crucial to optimize Resource Utilization to sustain operational efficiency. Better alignment between resource availability and production needs helps reduce idle times and ensure smoother operational continuity.
- d. Balancing Order Fulfillment and Capacity: As the volume of orders increases, it is essential to maintain a careful balance between accepting new orders and fulfilling current commitments within the agreed timelines. It is also pivotal in ensuring customer satisfaction while preventing a rise in overdue orders.

Figure 38: Dafram S.p.A. - Company Organizational Chart

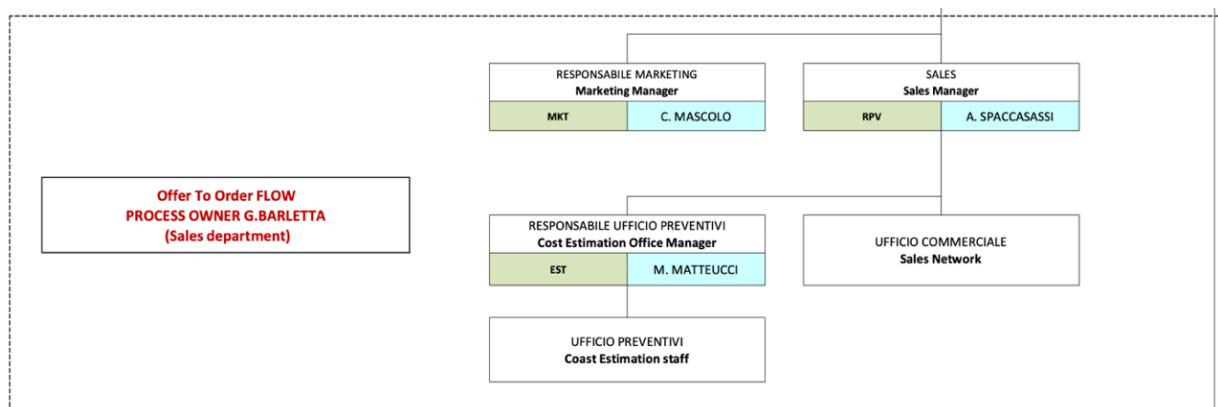


Source: Dafram S.p.A

The Organizational Structure is well-structured and agile, with defined roles and responsibilities across various departments (see Figure 38). Production, Quality, Safety, Sales, Marketing, and Administration are the operational areas highlighted by the Organizational Chart above, each managed by attentive and responsible leaders.

Given the Sales and Operations Planning process as the main topic of the current research, Figure 39 becomes central for focusing the attention on the Sales Department, which plays a pivotal role within the S&OP process itself. Not by chance, the Sales Department ensures that customer demands are completely satisfied while maintaining alignment the supply, production and operational objectives. Specifically, within the department itself, Armando Spaccasassi, the Sales Manager, is a fundamental part of the team, as well as the Marketing Manager Carmen Mascolo and the entire Cost Estimation Office Staff, with Marco Matteucci as responsible. Another significant figure is Gianfranco Barletta, responsible for managing the Offer to Order Flow, transforming customer offers into concrete sales.

Figure 39: Sales Department Organizational Structure - Dafram S.p.A



Source: Dafram S.p.A

2. DESCRIPTION OF THE QUESTIONNAIRE AND METHODOLOGY.

2.1. Structure and Objectives of the questionnaire.

The questionnaire is the chosen survey instrument for assessing two areas of Dafram S.p.A.: the *Maturity of the S&OP Process* and the *Strategic Consensus*. The data has been collected into an Excel database (see Appendix B) to facilitate the analysis, and the full PDF questionnaire is provided in Appendix A for reference. Let's go in deep.

2.1.1. First part of the questionnaire: Maturity of S&OP Process.

The first part of the questionnaire focuses on evaluating the Maturity of the S&OP Process and is divided into several sections, the following:

- a. The Organizational Culture section is focused on weighting three key aspects:
 - i. Collaboration and Communication between departments, so how effectively they operate together and how information is shared internally and externally are the two points investigated by the first question, which aims to assess whether Dafram operates in silos or whether there is a culture of cooperation.
 - ii. Strategic Alignment and Results Orientation are the two points examined by the second question, to understand whether employees have a collective vision of the goals and how focused the organization is on achieving results as a whole, rather than individual departments working towards isolated goals.
 - iii. Reward Systems is the point of focus of the third question, which looks into how employees are recognized and rewarded, highlighting the importance of incentives and motivation.
- b. The Organizational Structure section is designed to assess the following aspects:
 - iv. Organizational Reality and Integration between the Sales and Operations departments are the two points the first question seeks to identify, evaluating whether departments operate independently or if there are dedicated teams or roles to mediate between market demands and production efficiency.
 - v. Top Management Sponsorship and Support to S&OP actively provided by the Top Management itself are the two points measured by the second question., in order to evaluate whether the TMT recognizes the importance of the S&OP process and whether they are involved in fostering an integrated culture for cross-departmental communication.
 - vi. Presence of a Structured S&OP Process in place is the point assessed by the third question. It looks at the definition of roles and responsibilities within the process, so the level of formality, and alignment of the company's planning activities across departments to have an effective decision-making process and resource management system.
- c. The Business Process section is designed to address four focal points:
 - vii. Demand Planning is the point studied by the first question to understand if the company relies on individual departments' insights or if there is a structured process for demand forecasting.

- viii. Production and Supply Planning is the point evaluated by the second question to investigate if the company conducts detailed capacity and material checks, and if these processes are formalized or based on experience-driven practices.
 - ix. Inter-functional Meetings Structure is the point on which the third question focuses, examining whether such meetings are formalized, with clear agendas and follow-up actions, or if they are more ad-hoc and reactive.
 - x. S&OP Process Way of Conduction is the point of focus of the fourth question to generally evaluate if the reality has a formal process for balancing supply and demand, or if meetings are informal and primarily focused on resolving urgent issues. The question also tries to understand if the S&OP process includes structured preparation, regular meetings, and follow-up with Top Management.
- d. The Supporting Tools section is divided into the below three subsections, for which each manager has had the possibility to choose more than one answer to be as exhaustive as possible:
- xi. Demand Planning Tools is the point stressed by the first subsection with options that range from basic methods, such as emails and manual spreadsheets, to more advanced tools like ERP tables without algorithmic development, BI reports, and even Machine Learning algorithms.
 - xii. Supply Chain Planning Tools is the point touched by the second subsection, which investigates the tools to manage supply chain processes, such as capacity planning and material procurement. They range from basic spreadsheets to more structured, automated systems like ERP tables, BI reports, MRP functionalities within ERP systems, and Advanced Planning & Scheduling (APS) systems.
 - xiii. S&OP Process Tools is the point analyzed by the third subsection. Again, it looks at whether Dafram uses basic tools for coordination, or if it employs more advanced options such as automated spreadsheets, BI reports, APS systems, Rough-Cut Capacity Systems, or What-if Analysis Optimization tools.
- e. The Performance Measurement includes the sequent key components:
- xiv. Demand Planning Performance is the point surveyed by the first question to have an idea about forecast accuracy and other key metrics. It also investigates if metrics are shared across departments or externally with key partners.
 - xv. Production and Procurement Performance are the points tested by the second question to explore whether Dafram tracks productivity, resource utilization, and supply chain constraints, and whether it does so through a formalized process.

- xvi. Key Performance Indicators is the point broke down by the last question to understand which of them are regularly monitored by the company. The list of indicators includes Revenue, Obsolete inventory levels, Stock turnover rates, Unfulfilled sales orders, Delivery punctuality, Service level, etc.

Ultimately, the objective of the first part of the questionnaire is to determine in which stage of S&OP Maturity Dafram S.p.A. currently stands, taking the *Lapide (2005) framework* as a reference point. The model has deeply been outlined in Chapter 2, thanks to Figure 9 that deeply and satisfying describes each stage.

However, there is not a predefined way of proceeding specifically tailored for assigning Dafram S.p.A to a particular Maturity Stage, instead, some comparisons and distinctions are made and fully explained in Paragraph 1.1. of the following Chapter.

2.1.2. Second part of the questionnaire: Strategic Consensus.

The second part of the questionnaire addresses the Within-Group Strategic Consensus, aiming at measuring the level of alignment among the Top Management Team regarding the 7 key strategic priorities, presented in Figure 28 and the relative paragraph. Each manager assigned a rating from 1 to 7 to each priority (where 1 represents the least important and 7 the most important), without the possibility of repeating numbers. Therefore, all numbers have been used, and none repeated.

The analysis is further supported by the calculation of Cronbach's *Alpha*, a measure used to evaluate the internal consistency of the responses. Alpha is a value that ranges [0-1]:

- a. $\text{Alpha} \approx 1$: High internal consistency, meaning that the TMT shares a unified view.
- b. $\text{Alpha} \approx 0$: Low internal consistency, which could highlight divergence in opinions or confusion among the leadership team regarding the company's key strategic focus areas.

The calculation coefficient follows the methodology introduced by Tarakci et al. (2014) in the article *Strategic Consensus Mapping: A New Method for Testing and Visualizing Consensus in Organizations*. In particular, the formula of interest for the computation of Alfa is shown on Page 40, at point b., and has been explained in Section 5 of Chapter 2, but given the mathematical complexity of calculations, the RSM Erasmus University of Rotterdam (Rotterdam, School of Management) has developed an online platform to automate the process.

Figure 40 shows the website interface.

Figure 40: Tarakci et al. (2014) website home

RSM *ERASMUS* UNIVERSITY

Strategic Consensus Mapping

Instructions **i** Home Visualization Statistics

This page provides visualizations and statistics of 'Strategic Consensus Mapping'. The details of the methodology is explained in [Tarakci et al. \(2014\)](#). Simply import your data using our template and click submit to visualize strategic consensus and to calculate the relevant within and between group statistics.

Please do not forget to cite our work: Tarakci, M., Ates, N. Y., Porck, J. P., van Knippenberg, D., Groenen, P. J. F. & de Haas, M. 2014. Strategic consensus mapping: A new method for testing and visualizing strategic consensus within and between teams. *Strategic Management Journal*, 35(17): 1053-1069.

[Download the template](#)

Upload data
Browse... No file selected

Submit data
Submit

☐ Include the team manager in analyses

Source: Tarakci et al., 2014

The tool is freely available at [Tarakci et al. \(2014\) website](#), providing the following instruments:

- a. Data Input: Users have the possibility to upload data using a template provided on the website, which allows for the entry of multiple fields, such as team IDs, team labels, individual respondent names, managerial status, and the rating of strategic goals.
- b. Visualizations:
 - i. Speaking about the Within-Team Strategic Consensus, Tarakci et al. (2014) state that each team member is represented as a vector and the proximity between vectors reflects the similarity of their ratings. The closer the vectors are, the more aligned the group is in views.
 - ii. Speaking about the Between-Team Strategic Consensus, Tarakci et al. (2014) propose to visualize the alignment between different teams by plotting each team as a bubble on a map. The size of each bubble reflects the level of internal consensus, with larger bubbles indicating greater within-team alignment. The proximity of bubbles represents the degree of consensus between teams—the closer the bubbles, the greater the Strategic Consensus across teams.
- c. Statistics:
 - i. Alpha (α) represents the Within-Team Consensus and is calculated based on the orientations of all vectors in the multidimensional space.
 - ii. $r(A, B)$ assesses the Between-Team Consensus and ranges $[-1:1]$, where 1 indicates perfect alignment between teams, 0 indicates no strategic consensus, and -1 signals opposing strategic views between teams.

- d. Output: Visualizations and statistics could be downloaded. Users have the possibility to zoom in and out of the maps, and the outputs can be saved as PNG files or downloaded as Excel spreadsheets.

Ultimately, the scope of the second part of the questionnaire is the calculation and interpretation of the Within-Group Strategic Consensus, so the value of Alfa (α). On the other hand, the calculation of r (A, B) could serve as a valuable avenue for further analysis, for revealing weaknesses and for having deeper insights.

For more details on interpreting the visualizations and statistics generated by the tool, please refer to the instructions and interpretation guidelines available on the [Tarakci et al. \(2014\) website](#) and in the original article by the same authors.

2.1.2.1. Illustrative Example from the Website for Application on Dafram S.p.A.

The goal of the following explanatory paragraph is to present the example available on [Tarakci et al. \(2014\) website](#), offering a demonstration to better understand the concept and then apply the same to Dafram S.p.A.'s data. Specifically, on the home page (see Figure 41), by clicking on “Download the template”, interested people have the opportunity to access the demonstrative Excel file below:

Figure 41: Example of Goal Evaluation Table from the Website

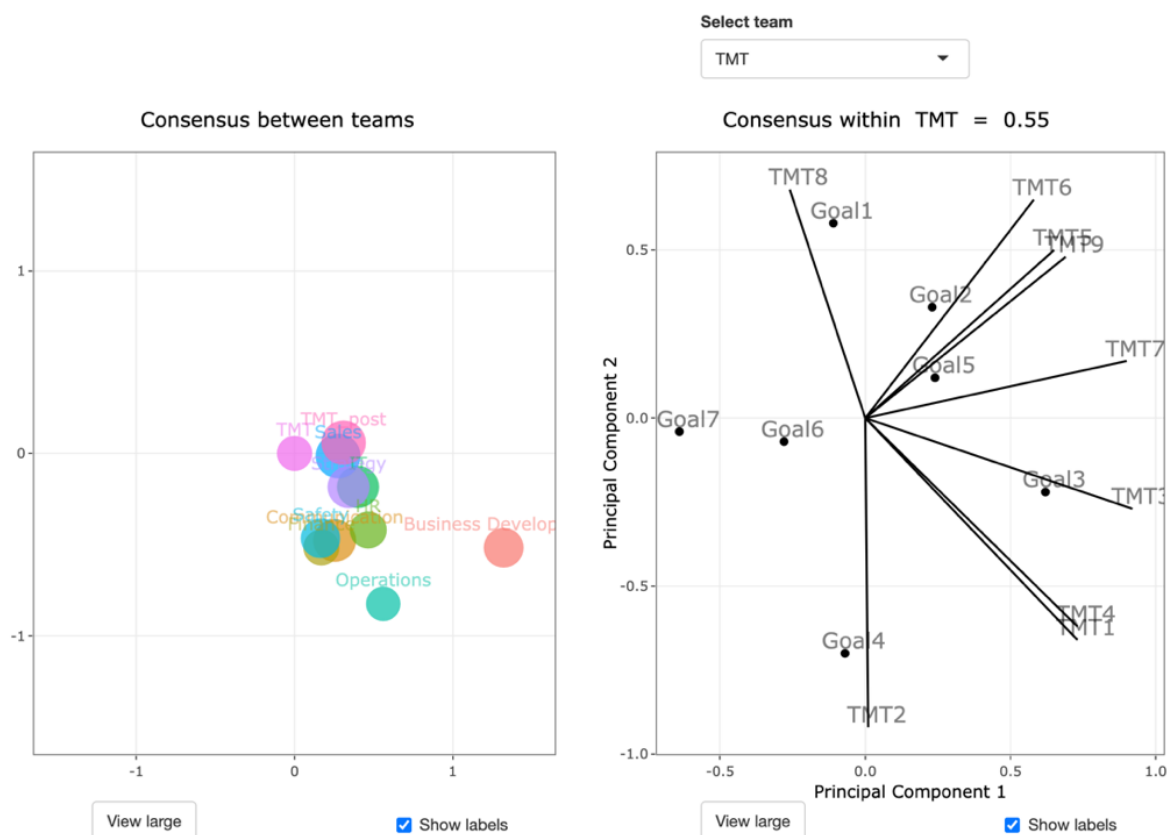
teamID	teamLabel	name	Manager	Goal1	Goal2	Goal3	Goal4	Goal5	Goal6	Goal7	5 Operations TMT5	1	5	6	7	1	3	4	2
1	TMT	TMT1	0	1	4	7	6	5	3	2	5 Operations Tech1	0	7	2	4	3	6	1	5
1	TMT	TMT2	0	2	1	6	7	3	5	4	5 Operations Tech2	0	6	2	5	3	7	4	1
1	TMT	TMT3	0	3	4	7	5	6	2	1	5 Operations Tech3	0	7	6	4	1	3	5	2
1	TMT	TMT4	0	2	3	7	6	5	4	1	5 Operations Tech4	0	2	3	7	6	5	1	4
1	TMT	TMT5	0	5	6	7	1	3	4	2	5 Operations Tech5	0	7	1	6	4	2	5	3
1	TMT	TMT6	0	6	5	4	2	7	3	1	6 Finance TMT6	1	6	5	4	2	7	3	1
1	TMT	TMT7	0	4	5	7	3	6	1	2	6 Finance FI1	0	7	5	4	2	6	3	1
1	TMT	TMT8	0	7	2	3	1	6	4	5	6 Finance FI2	0	6	3	7	2	5	4	1
1	TMT	TMT9	0	5	7	6	2	3	4	1	6 Finance FI3	0	7	4	5	6	3	2	1
2	Strategy	TMT2	1	2	1	6	7	3	5	4	6 Finance FI4	0	3	2	6	7	4	5	1
2	Strategy	SR1	0	7	4	5	3	6	1	2	6 Finance FI5	0	1	2	3	5	7	4	6
2	Strategy	SR2	0	5	3	6	4	7	2	1	6 Finance FI6	0	4	1	7	3	6	5	2
2	Strategy	SR3	0	6	1	7	4	5	2	3	7 IT TMT7	1	4	5	7	3	6	1	2
2	Strategy	SR4	0	4	3	6	5	7	2	1	7 IT IDS1	0	4	3	5	6	7	2	1
2	Strategy	SR5	0	7	6	5	3	4	1	2	7 IT IDS2	0	4	1	6	2	7	5	3
2	Strategy	SR6	0	5	6	7	4	2	1	3	7 IT IDS3	0	6	5	7	1	3	4	2
2	Strategy	SR7	0	6	3	7	4	5	2	1	7 IT IDS4	0	6	2	5	4	7	1	3
2	Strategy	SR8	0	5	4	6	7	3	1	2	8 Business Dv TMT8	1	7	2	3	1	6	4	5
2	Strategy	SR9	0	5	1	4	6	7	2	3	8 Business Dv BD1	0	4	3	6	1	2	5	7
2	Strategy	SR10	0	7	4	5	3	6	2	1	8 Business Dv BD2	0	7	1	6	4	5	2	3
3	HR	TMT3	1	3	4	7	5	6	2	1	8 Business Dv BD3	0	2	1	7	4	5	3	6
3	HR	HR1	0	7	5	4	3	6	1	2	9 Communica TMT19	1	5	7	6	2	3	4	1
3	HR	HR2	0	5	4	7	2	6	3	1	9 Communica Com1	0	5	2	7	4	6	3	1
3	HR	HR3	0	7	1	5	3	6	4	2	9 Communica Com2	0	6	4	5	2	7	3	1
3	HR	HR4	0	2	1	7	3	6	5	4	9 Communica Com3	0	6	1	5	4	7	2	3
3	HR	HR5	0	1	3	6	5	4	2	7	9 Communica Com4	0	6	4	7	2	5	3	1
3	HR	HR6	0	3	1	7	2	6	5	4	9 Communica Com5	0	4	1	7	5	3	6	2
3	HR	HR7	0	5	6	7	4	3	2	1	10 Safety TMT1	1	1	4	7	6	5	3	2
3	HR	HR8	0	3	6	4	5	1	7	2	10 Safety HSSE1	0	4	2	7	3	5	6	1
3	HR	HR9	0	7	4	5	2	6	3	1	10 Safety HSSE2	0	6	4	7	1	5	2	3
3	HR	HR10	0	4	3	7	1	6	5	2	10 Safety HSSE3	0	7	6	5	3	2	4	1
3	HR	HR11	0	5	6	7	2	4	3	1	11 TMT_post TMT1	0	6	4	7	3	8	5	4
3	HR	HR12	0	5	1	7	2	3	6	4	11 TMT_post TMT2	0	4	5	7	6	8	2	3
3	HR	HR13	0	4	2	6	1	7	5	3	11 TMT_post TMT3	0	5	3	6	7	8	4	2
3	HR	HR14	0	5	1	7	3	6	2	4	11 TMT_post TMT4	0	6	5	8	3	7	4	2
3	HR	HR15	0	6	4	5	3	7	2	1	11 TMT_post TMT5	0	4	3	8	6	7	5	2
4	Sales	TMT4	1	2	3	7	6	5	4	2	11 TMT_post TMT6	0	3	2	7	4	8	6	5
4	Sales	MO1	0	6	3	5	4	7	1	2	11 TMT_post TMT7	0	4	6	8	3	7	4	2
4	Sales	MO2	0	4	3	7	6	5	1	2	11 TMT_post TMT8	0	5	4	6	7	8	2	3
4	Sales	MO3	0	7	4	6	2	5	1	3	11 TMT_post TMT9	0	2	4	8	7	6	5	3
4	Sales	MO4	0	4	5	7	3	6	2	1									

Source: Tarakci et al., 2014

The next step is to select the document to upload by navigating through the browser to locate the recently downloaded template. Additionally, by checking the box “Include the team manager in analyses”, it becomes possible to perform a more complete analysis, exactly the same as the one applied in the current research.

Then, click on “Submit the data”, and from the “Home” page, navigate to the “Visualization” page to view the resulting graphs of both the Between-Group Strategic Consensus, on the left-hand side, and the Within-Group Strategic Consensus (including the corresponding Alpha calculation of 0,55), on the right-hand side (see Figure 42).

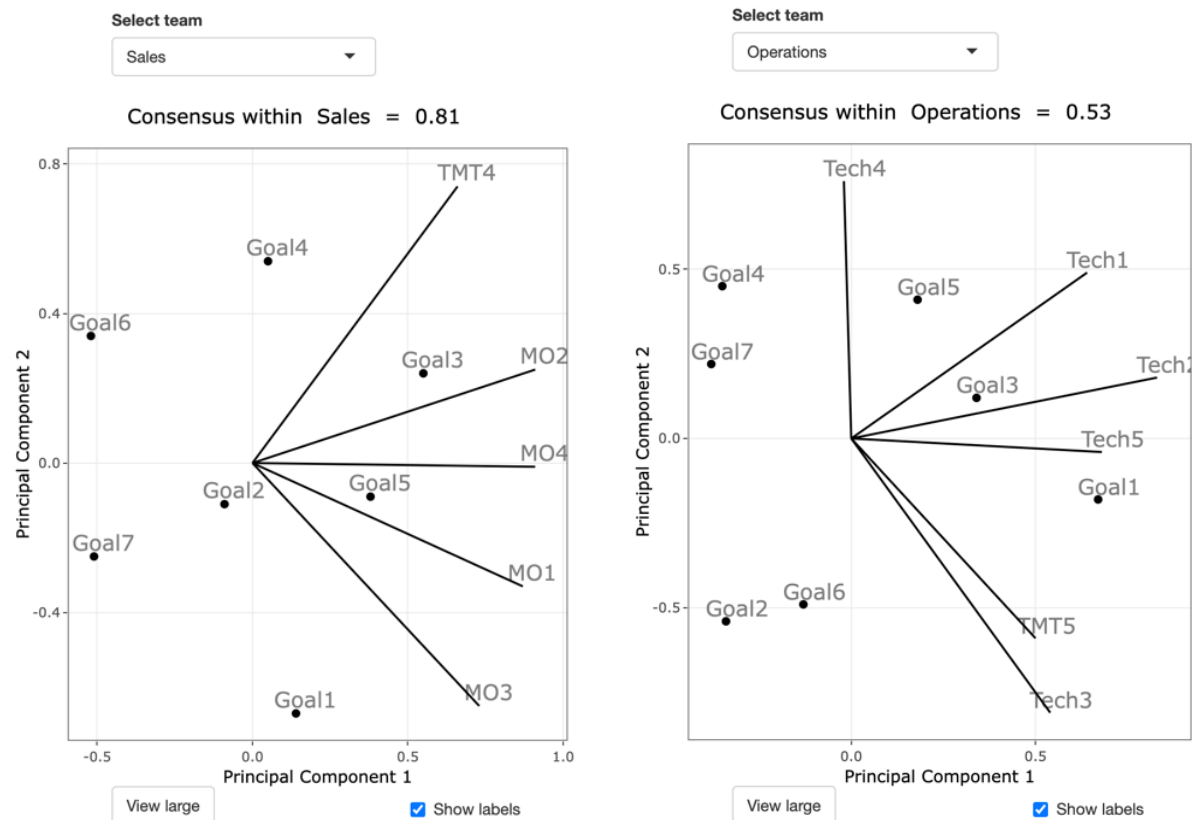
Figure 42: Example of Consensus Visualization from the Website



Source: Tarakci et al., 2014

In the upper right corner of the provided example, because the analysis is broader than what has been performed for Dafram S.p.A., the user has the possibility to select the team for which to know the Alpha and the Within-Group Strategic Consensus representation. Below are two randomly picked examples (see Figure 43): the Sales Team Alpha of 0.81, the highest value among those of all the teams, and the Operations Team Alpha of 0.53, the lowest value among those of all the teams.

Figure 43: Example of Within-Group Consensus Visualization



Source: Tarakci et al., 2014

Lastly, an additional option to view statistics related to both Alpha (α) and $r(A,B)$ is available, for each team who has actively participated to the survey. Below is a demonstrative figure, even if it has not been applied to Dafram S.p.A. but could and should be recommended done.

Figure 44: Example of Between-Group Consensus Statistics $r(A,B)$

Show entries

teamID	teamName	Alpha	1	2	3	4	5	6	7	8	9	10	11
1	TMT	0.55	1.00	0.72	0.71	0.86	0.41	0.74	0.79	-0.03	0.77	0.85	0.82
2	Strategy	0.73	0.72	1.00	0.78	0.96	0.74	0.83	0.91	0.32	0.87	0.71	0.79
3	HR	0.60	0.71	0.78	1.00	0.81	0.84	0.88	0.95	0.57	0.95	0.87	0.83
4	Sales	0.81	0.86	0.96	0.81	1.00	0.62	0.80	0.94	0.27	0.87	0.77	0.89
5	Operations	0.53	0.41	0.74	0.84	0.62	1.00	0.82	0.76	0.60	0.87	0.73	0.49
6	Finance	0.57	0.74	0.83	0.88	0.80	0.82	1.00	0.85	0.29	0.96	0.90	0.81
7	IT	0.73	0.79	0.91	0.95	0.94	0.76	0.85	1.00	0.45	0.94	0.81	0.90
8	Business Development	0.67	-0.03	0.32	0.57	0.27	0.60	0.29	0.45	1.00	0.39	0.31	0.26
9	Communication	0.75	0.77	0.87	0.95	0.87	0.87	0.96	0.94	0.39	1.00	0.91	0.82
10	Safety	0.66	0.85	0.71	0.87	0.77	0.73	0.90	0.81	0.31	0.91	1.00	0.75
11	TMT_post	0.80	0.82	0.79	0.83	0.89	0.49	0.81	0.90	0.26	0.82	0.75	1.00

Showing 1 to 11 of 11 entries

Previous Next

Source: Tarakci et al., 2014

3. QUESTIONNAIRE PARTECIPANTS AND CONCLUSIONS.

The questionnaire has been administered to 9 members of Dafram's TMT, including the Purchase Dept. Manager, Cost Estimation Office Manager, Marketing Manager, Financial Control-Accounting Manager, Sales Manager, Department Production Manager 1, Department Production Manager 2, Project Management Manager, and the Plant Manager (CEO).

TMT members are responsible for proposing initiatives about short and long-term strategy and about investment plans, which are then presented by the intermediary General Manager Nicola Chiavari to the Board of Directors, that consists of Aldo Chiavari (President), Luigi Barbafina, Alessandro Chiavari, Marta Giovanna Chiavari, and Carmen Mascolo. Most of the BoD members do not actively participate in the daily operations of the company, due to other professional commitments and other reasons.

In addition, the questionnaire has been presented during the TMT's monthly meeting, which took place on October 1st, 2024, by the General Manager N. Chiavari, who explained its structure and objectives after receiving my detailed briefing. Following the meeting, the questionnaires have been distributed privately to each TMT member via their company email accounts. Responses have been collected anonymously, ensuring the confidentiality and eliminating the potential for external influence or contamination in the results.

In conclusion, the questionnaire has provided valuable insights into the internal dynamics of the company. The data collected from the TMT plays a crucial role in the subsequent paragraphs containing the analysis, revealing the current state of Dafram's S&OP Maturity, its level of Within-Group Strategic Consensus and identifying areas of weaknesses that may require further improvements to be reached by practical recommendations.

CHAPTER 4 – DATA ANALYSIS AND RECOMMENDATIONS TO BRIDGE REPRESENTATIONAL GAPS THROUGH SMM

INTRODUCTION TO THE CHAPTER.

The chapter focuses on a detailed analysis of the data collected from the questionnaires administered to the members of the Top Management Team of Dafram S.p.A. and provides practical recommendations to enhance the company's overall way of working, in general, and the efficiency of the Sales & Operations Planning Process, in particular. Starting from the results regarding the Maturity of the S&OP Process and the Strategic Consensus within the TMT, the main objective is to identify weaknesses and suggest solutions based on the enhancement of the Shared Mental Models. Specifically, by applying Lapide's S&OP Maturity Model (2005) and Tarakci et al.'s Strategic Consensus Model (2014), practical recommendations are presented to improve coordination and internal alignment, with the aim of increasing operational efficiency and Dafram S.p.A.'s competitiveness. Additionally, the chapter explores the cause and consequences of low Strategic Consensus, with attention to the intra-group conflicts that arise from it and their impact on overall company performance.

Ultimately, the approach serves to close the circle of the research, offering a pathway for Dafram S.p.A. and similar companies to find success by acting on the foundation of that path: the understanding and sharing of goals and priorities.

Before starting a journey, it is essential to know where one wants to go; otherwise, each person may choose the path they deem appropriate, but the desired result will never be achieved, or at the very least, it will not be reached together as it should be.

1. PRESENTATION OF THE RESULTS.

The databases collecting data coming from questionnaires and studied in the analysis are in the appendices. Specifically, Appendix A contains the questionnaires compiled into a single PDF file, Appendix B includes the data from the S&OP Maturity questionnaire, and Appendix C provides the table representing the Strategic Consensus survey results.

1.1. Maturity of the S&OP process – Analysis of the results.

The rough collected data are shown in Appendix B, while Appendix D presents them in a more structured way to go deeper in the analysis.

As already stated in the previous chapter, the questionnaire has been organized into five main categories: Organizational Culture, Organizational Structure, Business Process, Supporting Tools, and Performance Measurement. Each category has been further divided into subcategories, each of them corresponding to individual questions. In the database of Appendix D, the questions have been rephrased for conciseness and impact while preserving their original meaning. Moreover, for each question, answers have been written down, and the number of respondents selecting each of them has been recorded. Finally, to make everything clearer, the following visualization tools have been employed:

- a. Pie Charts for questions related to Organizational Culture, Organizational Structure, Business Process, and a portion of the Performance Measurement category to have an idea of the variety of responses using colors: blue for the most common response, orange for the intermediate one, and green for the least common.
- b. Bar Charts for the Supporting Tools category to depict the three most frequently options.
- c. For the remaining portion of the Performance Measurement category, all available tools used by the company to monitor performance have been listed, with the number of respondents who selected each tool indicated. Respondents could choose multiple tools.

Lapide's S&OP Maturity Model has enabled the creation of the association table (see Figure 45), allowing each questionnaire subcategory to be linked to one of Lapide's dimensions across the various stages. To accurately determine the actual Maturity stage for each subcategory, the additional table shown in Figure 46 has been generated. It collects the percentages of respondents who provided the different answers, making it easier to identify a single representative response. The process simplifies the assignment of the most appropriate Maturity Stage from Lapide's model to each answer, and the assigned one is highlighted in red, making it easier for Dafram S.p.A. to focus on the areas that require the most improvement.

From the foregoing, it has always been clear that the stages in Lapide's model concern different aspects of S&OP Process: frequency and formality of meetings, the level of integration-or lack of between supply and demands, and the degree of sophistication of the technology tools used-from very basic manual ones to highly developed integrated systems. It represents a highly detailed framework with a neat roadmap for the businesses willing to develop their planning processes from the earlier basic stage to the more sophisticated stage in the process of maturation.

Figure 45: Mapping Questionnaire to Lapide's S&OP Maturity Stages

Questionnaire Category	Specific Dimension	LAPIDE'S 4 STAGES OF S&OP MATURITY			
		Stage 1 - Marginal Process	Stage 2 - Rudimentary Process	Stage 3 - Classic Process	Stage 4 - Ideal Process
Organizational Culture	1. Collaboration	Minimal communication	Regular communication but with irregular participation	Effective communication and full collaboration	Advanced internal and external collaboration
	2. Strategic Alignment	Lack of common vision	Partial alignment of shared objectives	Alignment of objectives across functions	Company-wide shared strategic vision
	3. Reward System	No structured incentive system	Individual performance evaluation	Incentives based on operational KPIs	Reward programs tied to strategic goals
Organizational Structure	4. Formality of the S&OP Process	No formal process	Partially structured process	Fully structured process	Event-driven and fully integrated process
	5. Interdepartmental Integration	Separate functions with limited communication	Limited collaboration across departments	Integration of functions with shared processes	Cross-functional and external partner collaboration
	6. Management Support	Limited support for operational functions	Direct support for certain processes	Active management participation in S&OP	Continuous strategic involvement from top management
Supporting Tools	7. Technology for Demand Planning	Use of spreadsheets	Standalone software for planning	Integration of planning software	Advanced integrated collaboration tools
	8. Technology for Supply Chain	No automation	Basic automation (simple MRP)	MRP integrated with ERP	Advanced integration and complete automation
	9. S&OP Tools	Communication via email	Non-integrated software support	Structured and automated software tools	Integrated collaborative platforms
Performance Measurement	10. KPI Monitoring	No structured monitoring	Monitoring of basic operational performance	Well-defined KPIs covering all functions	Advanced KPIs with predictive analytics and optimization
	11. KPI Integration	Disconnected metrics across departments	Operational KPIs partially shared among functions	KPIs aligned with corporate objectives	KPIs integrated and used for strategic decisions
	12. Performance Analysis	No formal analysis	Occasional analysis focused on operations	Regular analysis with a focus on continuous improvement	Predictive analysis and scenario-based optimization

Source: Own elaboration using Excel

Figure 46: Table of Questionnaire Results: Assigned S&OP Maturity Stages

Specific Dimension	Questionnaire Results	Assigned Stage	
Collaboration	45% of respondents indicated that internal and external communication is essential, while 33% reported limited communication.	Regular communication but with irregular participation	Stage 2
Strategic Alignment	56% reported a shared vision between S&OP and top management, while 33% noted a lack of alignment between operations and top management.	Partial alignment of shared objectives	Stage 2
Reward System	67% indicated a mixed evaluation system, while 22% mentioned individual performance evaluation.	Individual performance evaluation	Stage 2
Formality of the S&OP Process	34% reported a formal and structured S&OP process, while 33% indicated that planning meetings are not fully formalized.	Partially structured process	Stage 2
Interdepartmental Integration	56% indicated incentivized interaction between sales and production, while 22% reported limited interaction.	Limited collaboration across departments	Stage 2
Management Support	78% noted that top management recognizes the importance of S&OP, but 22% reported management support focused on specific activities.	Active management participation in S&OP	Stage 3
Technology for Demand Planning	7 respondents use email for demand planning, 5 use ad-hoc spreadsheets, and 3 use ERP tables without algorithmic support.	Use of spreadsheets	Stage 1
Technology for Supply Chain	6 use ad-hoc spreadsheets, 5 use ERP tables without algorithms, and 4 use MRP functionalities.	Basic automation (simple MRP)	Stage 2
S&OP Tools	Most respondents reported using email (5) and ad-hoc spreadsheets (4), with limited use of automated spreadsheets (3).	Communication via email	Stage 1
KPI Monitoring	9 monitor forecast accuracy, and 8 monitor resource saturation and inventory, showing a focus on operational metrics.	Well-defined KPIs covering all functions	Stage 3
KPI Integration	The most monitored metrics are forecast accuracy (9) and inventory levels (8), suggesting limited integration across functions.	Operational KPIs partially shared among functions	Stage 2
Performance Analysis	The focus is on operational indicators, such as resource saturation and service levels, with 7 monitoring delivery punctuality.	Occasional analysis focused on operations	Stage 2

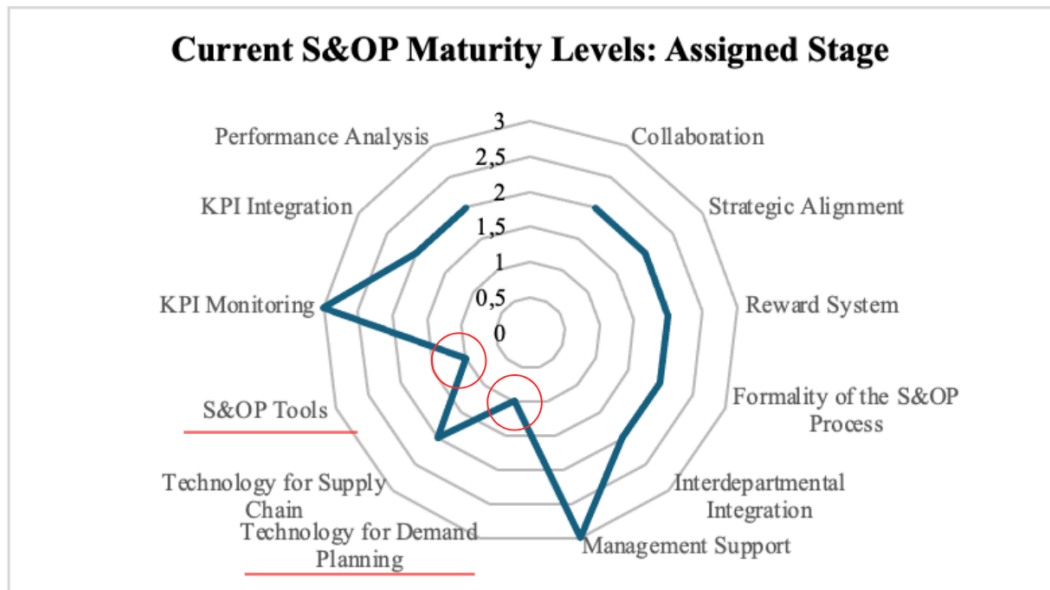
Source: Own elaboration using Excel

To make it even easier, it is possible to visually assess how distant Dafram S.p.A. is from the ideal level, which corresponds to Stage 4, thanks to two Radar Charts which have been created.

- The first Radar Chart (see Figure 47) illustrates Dafram's current Maturity across the various subcategories. It clearly shows that the company is significantly underdeveloped in key areas such as S&OP Tools and Technology for Demand Planning, all of which are still at Stage 1 and circled and underlined in red. The reliance on basic tools limits Dafram's ability to effectively manage its S&OP Processes. On the other hand, areas such as Collaboration, Interdepartmental Integration, and Strategic Alignment have reached Stage 2, suggesting some progress but still lacking the full structure and formalization required to move to higher stages of Maturity.

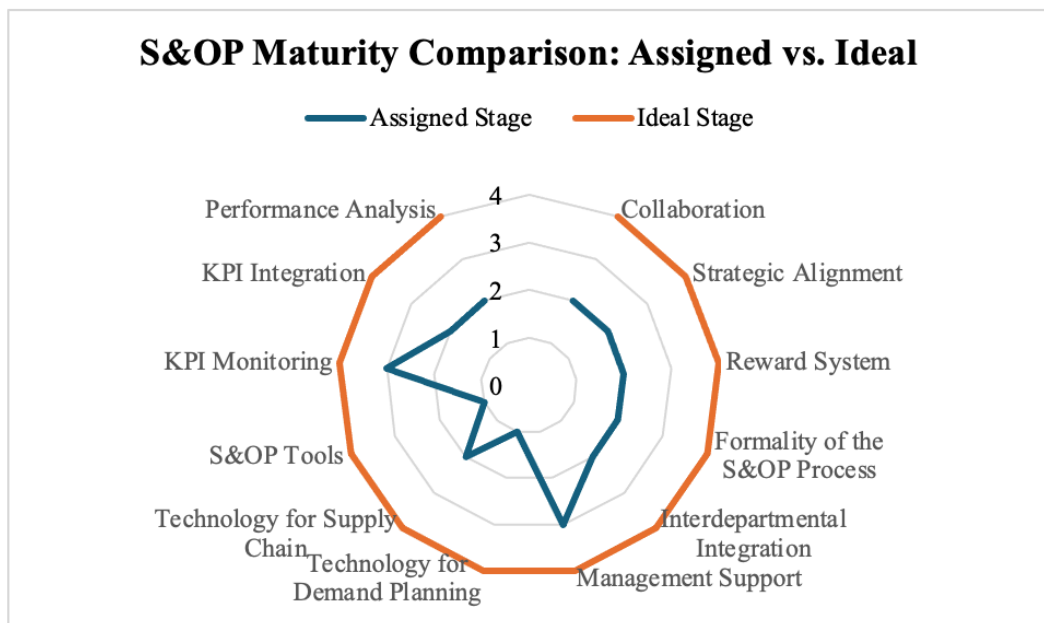
- b. The second Radar Chart (see Figure 48) provides a comparison between Dafram's current Maturity levels (represented in blue) and the ideal Stage 4 (shown in orange). The gaps across all dimensions are immediately observable. The ideal state represents a fully integrated and automated system, supported by advanced tools and strong cross-functional collaboration, while Dafram's current state, especially in the use of supporting tools and technology, is far from it.

Figure 47: Radar Chart of Current S&OP Maturity Levels



Source: Own elaboration using Excel

Figure 48: Comparison of S&OP Maturity: Assigned Stages vs. Ideal Stage



Source: Own elaboration using Excel

Overall, the charts emphasize that although there is some structure in place, Dafram S.p.A faces challenges in achieving the fully integrated process typical of higher Maturity Stages. The analysis shows that the company must prioritize the improvement of its technological infrastructure and tools, especially in S&OP and Demand Planning. Addressing critical deficiencies is essential for advancing in other areas such as Collaboration and Strategic Alignment, ultimately helping Dafram move closer to the Ideal S&OP Process Stage.

Finally, looking at the results for each subcategory, it becomes evident that Stage 2 is the most prevalent across the various dimensions. It is reflected in the questionnaire responses, where a majority of subcategories—such as Collaboration, Strategic Alignment, Formalization of the S&OP Process, Interdepartmental Integration, and Technology for the Supply Chain—have been consistently assigned to Stage 2, indicating a *Rudimentary Level of Maturity of the S&OP Process*.

To make a clarification, all data processing, including the creation of the database, pie charts, bar charts, association tables, and radar charts, has been performed using Excel. Given the results, recommendations and advice will be provided in the following paragraphs, as well.

1.2. Strategic Consensus – Analysis of the results.

The rough collected data are shown in Appendix C, where a summary table presents the responses of each manager, part of the Top Management Team, for each strategic priority. The table assigns a ranking from 1 to 7 to the different priorities, with no repetition of numbers, reflecting the relative importance each manager attributed.

The analysis of the results for this part of the questionnaire has been relatively straightforward, as the data, once collected, has been uploaded to the [Tarakci et al. \(2014\) website](#), which then automatically has analyzed them. As previously mentioned, the website—developed by the Erasmus University of Management in Rotterdam—requires the results to be formatted following the reference template, as shown in Figure 41, to ensure consistency in the data input and to allow for a more accurate analysis. In particular, the table uploaded is shown in Figure 49, where each column represents the managers' ratings for the 7 strategic goals (Goal1: Safety; Goal2: Expert Staff; Goal3: Strategic Partnership – Reliable Network; Goal4: Economic Reliability of Products/Processes; Goal5: Organizational Structure; Goal 6: Risk Management; Goal7: Environmental Sustainability).

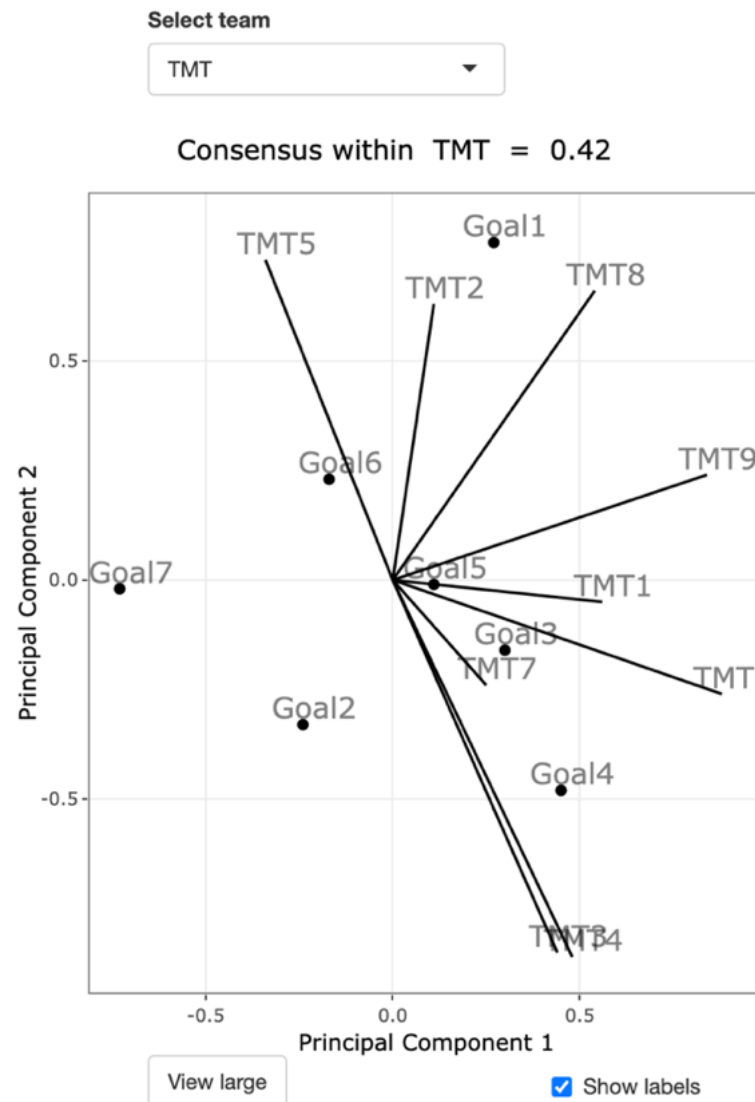
Moreover, the specific column labeled “Manager” contains only “1” for all respondents, indicating that all participants in the analysis are managers. Each manager represented a different functional area of the company.

Figure 49: Dafram S.p.A. Strategic Priorities– Uploaded on Tarakci Website

teamID	teamLabel	name	Manager	Goal1	Goal2	Goal3	Goal4	Goal5	Goal6	Goal7
1	TMT	TMT1	1	4	3	2	7	5	6	1
1	TMT	TMT2	1	7	1	2	4	6	3	5
1	TMT	TMT3	1	1	4	6	7	5	2	3
1	TMT	TMT4	1	1	5	6	7	4	3	2
1	TMT	TMT5	1	7	4	3	2	1	6	5
1	TMT	TMT6	1	5	4	6	7	3	2	1
1	TMT	TMT7	1	5	6	1	7	4	2	3
1	TMT	TMT8	1	7	3	5	2	6	4	1
1	TMT	TMT9	1	6	2	7	5	3	4	1

Source: Own elaboration using Excel

Figure 50: Dispersion of Strategic Priorities within the TMT at Dafram S.p.A.



Source: Tarakci et al. (2014) website

The data analysis reveals a moderate level of Within-Group Strategic Consensus among the members of the Top Management Team (TMT), with a score of 0.42 and it is visually represented in Figure 50, where the vectors correspond to TMT members and the points to strategic goals. The angles between the vectors highlight significant variability in how priorities are assigned, reflecting differing perspectives that could undermine the cohesion needed for effective strategic management.

The chart underscores these discrepancies, which could lead to the operational challenges discussed from Paragraph 2 onwards in the current chapter. While there is some shared understanding, the remaining divergences must be addressed to enhance the Sales & Operations Planning (S&OP) process, improving its maturity and overall effectiveness. The following paragraphs will provide specific recommendations to bridge these gaps and strengthen strategic alignment within the team.

2. THE MAIN CAUSES OF LOW STRATEGIC CONSENSUS.

Strategic Consensus is the extent to which members of the team share a common view of organizational objectives and priorities. When these are lacking, misalignments arise that create coordination problems and difficulties in achieving objectives collectively.

The main cause of the low level of Strategic Consensus is the existence of Representational Gaps. Representational Gaps occur when team members have dissimilar mental models of a problem, acquired through their unique knowledge, experiences, and values. The gaps also hinder effective communication and collaboration. Specifically, Representational Gaps are a group problem that emanates from the question about how individual members of the group represent a problem. They are developed from domain-specific knowledge and are based on personal cognitive structures guiding individuals in problem-solving (Chi, Feltovich, & Glaser, 1981). In a group, the Joint Representation could be thought of as the collective cognitive structure that represents the group's approach to solving a problem, which is understood only by examining the combined individual representations of all team members (Cannon-Bowers, Salas, & Converse, 1993).

The question arises: why would team members, presumably working towards the same goals, differ in their representations of a problem? The reason is that people operate problem-solving based on previously obtained knowledge; that is, they tend to conceptualize the problem in such a way that fits their current knowledge (Dougherty, 1992; Weingart et al., 2005). For example, a Financial Manager would interpret the decrease in income as bad financial management while a Marketing Manager can associate it with failure in the promotion of the

product. This is because people use what they know to make sense of the world and thus interpret problems into a form that allows them to use what they know.

Unlike knowledge, which dictates “what can be done”, values influence “what should be done”. As a result, even when working on the same problem, people’s problem representations can differ, as these are shaped by their skills, experience, and personal values (Cronin & Weingart, 2007).

Moreover, Problem-Solving involves processing information that is relevant to the situation to select actions that bring the situation closer to the desired outcome. Information is processed through the lens of an individual’s Problem Representation. Interpreting information involves determining which parts of it are relevant, while evaluating it involves assessing how useful it will be for achieving the problem’s goals (Bransford & Johnson, 1973; Daft & Weick, 1984; Duimering & Wensley, 2001; Lindsay & Norman, 1977; Nonaka, 1994). In this way, an individual’s Problem Representation shapes both the Interpretation and Evaluation of information (Cronin & Weingart, 2007).

As Cronin and Weingart (2007) pointed out, Representational Gaps occur when teammates are unable to effectively process each other’s information because they conceptualize and evaluate the problem differently, due to their varied knowledge and values. Representational Gaps lead to several problems in teamwork, the sequent:

- a. The increase in misunderstandings and improper use of information;
- b. The decline in both explicit and implicit coordination;
- c. The development of conflicts, which are more often detrimental than productive.

Coordination problems arise when the actions of one team member contradict or interfere with the actions of another. Meanwhile, conflict arises when there is disagreement about the actions that should be taken or how to interpret information.

In addition to Representational Gaps, Demand Unpredictability is another significant factor contributing to Dafram’s low Strategic Consensus and low S&OP Process Maturity, as recognized by the General Manager and Sales and Purchasing Managers during a recent site visit. In fact, the company’s limited ability to accurately forecast demand—only obtaining reliable data approximately 10 days before the sale—further complicates strategic alignment. The Unpredictability of Demand exacerbates the challenges of coordination, as different departments may prioritize conflicting objectives based on their interpretations of how to handle the Uncertain Demand. For instance, the sales team may push for increased production to meet potential surges in demand, while the operations team may advocate for inventory control to avoid overproduction, leading to fragmented strategies and misaligned priorities.

These challenges are compounded by existing difficulties in achieving Strategic Consensus due to Representational Gaps. Therefore, addressing both these gaps and the Unpredictability of Demand is crucial for improving decision-making and increasing the overall maturity of the S&OP process at Dafram S.p.A.

Representational Gaps and Demand Unpredictability are major factors contributing to the low Strategic Consensus, as they prevent alignment between team members' cognitive models, which are vital for effective collaboration and decision-making. When shared models are lacking due to Representational Gaps, misinterpretations, poor communication, and conflicts over how information is understood, and decisions are made often arise (Cronin & Weingart, 2007). In processes like S&OP, gaps lead to fragmented strategies, as different functions within an organization may prioritize conflicting goals (Weick, 1995). Therefore, enhancing Strategic Consensus and decision-making involves managing Demand Unpredictability and bridging Representational Gaps by developing What-If Scenarios and Shared Mental Models, topics that will be explored in more detail in the following sections.

3. THE MAIN CONSEQUENCES OF LOW STRATEGIC CONSENSUS.

To make it clearer, the above paragraph is given in a form of a bullet-point list so that consequences of low Strategic Consensus could be straightforwardly seen.

- a. Conflicts. The primary consequence of low Strategic Consensus is the rise in conflicts, which manifest at various levels and undermine the functioning of the team. Shah et al. (2021) note that in the absence of a shared vision, conflicts tend to arise more frequently at the individual or subgroup level within a team, and not only destroy team cohesion but also significantly impair team performance.
- b. Operational Efficiency. Low Strategic Consensus also drastically reduces the team's ability to coordinate effectively. The lack of alignment leads to less consistent decisions, also known as Sub-Decisions, and to inefficient use of resources and delays in processes. It is further underlined by Carraro et al. (2024), who emphasize that the inability to coordinate efforts due to diverging Mental Models decreases Operational Efficiency, because resources that could be allocated to innovation or whatever are often diverted and wasted to managing internal conflicts and misunderstandings.
- c. Proactive Behaviors. Another significant effect of low Strategic Consensus is the reduction in the team's ability to engage in Proactive Behaviors. Team members are less motivated to propose solutions or challenge the status quo. Carraro et al. (2024) indicate

that the lack of proactivity not only limits continuous improvement but also stifles innovation and problem solving.

- d. Employee Motivation. Lastly, low Strategic Consensus has a negative impact on Employee Motivation, because team members may feel disoriented and unable to see their jobs' contributions. It also reduces emotional engagement and the sense of belonging to the group. In particular, environments where Strategic Consensus is lacking, employees tend to stick to predefined procedures, avoiding personal initiative or exploration of new ideas (Carraro et al., 2024).

In the end, low Strategic Consensus not only acts as a fueling factor in conflicts, but also reduces Team Cohesion and Operational Efficiency. In addition, it affects Employee Motivation very negatively. It is a kind of vicious circle: inefficiencies and conflicts lead to reduced Engagement and Creativity, causing further declines in Performance. Therefore, building and maintaining high Strategic Consensus, sharing of goals, and clear communication are really important in order to make the work environment cohesive, motivating, and productive.

3.1. Conflicts as the main consequence of low Strategic Consensus.

When agreement on objectives and strategies is weak or absent among the team members, they may come up with different perspectives on how to tackle the challenges, priorities, and the allocation of resources. Such differences sometimes create a situation where people fight and argue, thereby making Conflict the most usual and difficult result of Strategic Consensus deficiency. To better understand the dynamics of Intragroup Conflict, it is essential to examine three critical factors, deeply presented in the article written by Shah et al. (2021):

1. Conflict Origin: It refers to from which level the conflict arises. Research has shown that conflicts arising at the dyadic level may serve to enhance team performance in case of proper management, while more general team-level conflicts have a negative effect.
2. Conflict Evolution: refers to the trajectory conflict takes with time, remaining static, spreading, or concentrating. Curiously enough, conflict usually tends to stay within the source it is caused by. It leads to unresolved issues and what is famously called "Conflict Stasis".
3. Roles in Conflict: The roles taken when conflicts occur-whether one is the aggressor, the responder, or a bystander-also tend to have major implications for what is perceived and how it progresses. Those directly involved in conflicts often experience and perceive a greater intensity than those who are merely bystanders.

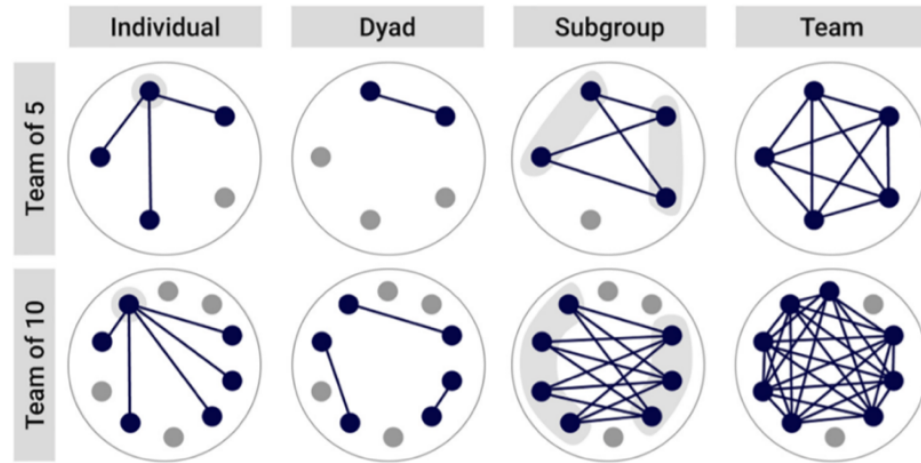
3.1.1. Intra-Group Conflicts: Origins and Evolution.

The study by Shah et al. (2021) has shown that conflicts are not uniform, shared, or static. Especially, the Intra-Group Conflicts have different roots, depending on the different dynamics that occur inside of the team sequenced.

- a. Individual-Level Conflict: Frequently, a single individual is the catalyst for conflict, and it occurs when a team member—often labeled as a “Principled Dissenter” or “Bad Apple”—challenges the strategic decisions of the group.
 - i. Bad Apples are “Individuals who chronically display behaviors that asymmetrically impair group functioning” (Felps, Mitchell, & Byington, 2006). They consistently display toxic behaviors that harm group functioning and are characterized by low agreeableness, lack of conscientiousness, and emotional instability (LePine, Hollenbeck, Ilgen, & Hedlund, 1997).
 - ii. Principled Dissenters, on the other hand, push teams to think critically by questioning decisions and offering alternative viewpoints. While they may cause conflict, it is typically task-related conflict, which could be beneficial for the group’s performance (Shah et al., 2021).
- b. Dyadic occurs between two members who cannot agree on how to move forward. Humphrey and his colleagues argued that Dyadic Conflict is the most relevant context in which team conflict is experienced (Humphrey, Aime, Cushenbery, Hill, & Fairchild, 2017). The conflict usually arises from perceptual differences, leading to distrust, miscommunications, and misunderstandings (Wall & Callister, 1995). Additionally, incongruent goals or competing interests in negotiations (Fisher, Ury, & Patton, 2011) and power or status differences (Anicich, Fast, Halevy, & Galinsky, 2015) (Bendersky & Hays, 2012) exacerbate tensions.
- c. Sub-Group Conflict occurs when teams split into smaller groups due to demographic or interest-based differences (Lau & Murnighan, 1998). These divisions, whether demographic (age, gender) or non-demographic (roles, expertise), often disrupt communication (Jehn, Northcraft, & Neale, 1999) (Polzer, Milton, & Swarm, 2002). Although Subgroup Conflict is common, it remains underexplored as a distinct form of Intragroup Conflict, with most research focusing on Team-Level dynamics (Korsgaard, Ployhart, & Ulrich, 2014) (Humphrey et al., 2017).
- d. Team-Level Conflict is generated when most of the team members are in direct conflict with each other due to interpersonal incompatibilities or differing viewpoints. While observers may exist, the majority of team members are behaviorally involved. It often

arises when leadership is unclear, or when strategic decisions are not effectively communicated or implemented (Shah et al., 2021).

Figure 51: Example of Conflict Network Configurations and their Origins



Source: Shah et al. (2021)

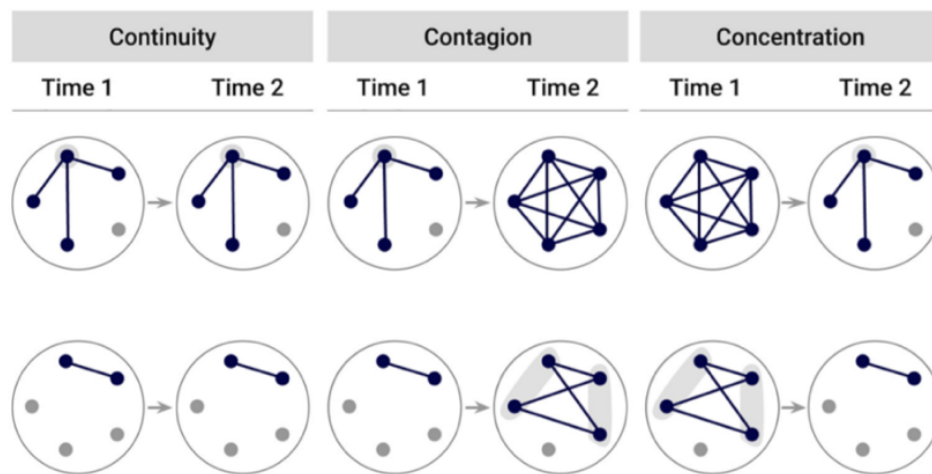
Each circle of the upper Figure depicts a Team Conflict Network. Darker network nodes represent team members behaviorally involved; lighter nodes represent team members who are observers. Network ties represent conflict between teammates. The shaded areas in the first and third columns highlight the team members who define the individual or subgroup origins.

Remember that not only do conflicts originate from different sources, but evolutionary paths are also complex (see Figure 52) (Shah et al., 2021):

- a. Conflict Continuity means that it remains confined to its original source without expanding or contracting. Continuity is often observed when team members adopt an Avoidance Strategy, choosing not to directly address the strategic disagreements (Schachter, 1951) (Boulding, 1964) (Nemeth, Brown, & Rogers, 2001) (Elder, Sutton, & Douglas, 2005).
- b. Conflict Contagion means that it spreads from a small subset of team members to the broader team, so from individual to dyad or from dyad to team. Several theoretical mechanisms explain how conflict spreads across a team:
 - i. Diffusion of Negative Affect: Negative emotions like hostility and irritability might amplify tensions and cause conflict to escalate from individuals to the whole team (Bartel & Saavedra, 2000) (Barsade, 2002) (Weingart, Behfar, Bendersky, Todorova, & Jehn, 2015).

- ii. **Allegiance and Group Dynamics:** Team members may feel compelled to take sides in a conflict, especially when they have strong interpersonal ties to those involved (Krackhardt, 1999) (Labianca, Brass, & Gray, 1998).
- iii. **Unstable Dyadic Conflicts:** Dyadic conflicts often involve others, turning into subgroup conflicts, which destabilize team dynamics as more members become involved (Labianca, Brass, & Gray, 1998) (Jehn, Rispens, Jonsen, & Greer, 2013).
- c. **Conflict Concentration** means that a conflict that initially involves a larger portion of the team becomes concentrated among a smaller subset of individuals. “Scapegoating” is common in high-pressure situations, and it is the process of blaming one person or group for the team’s dysfunction, offering psychological relief to others by reducing personal responsibility and providing an outlet for frustration. It often happens when team members seek a single source for problems (Gemmell, 1989) (Rothschild, Landau, Sullivan, & Keefer, 2012).

Figure 52: Evolution of Conflict in Teams



Source: Shah et al. (2021)

3.1.2. Intra-Group Conflicts: Main types.

Santos, Uitdewilligen, and Passos (2015) give a very enlightening explanation of different kinds of Intragroup Conflicts, which is interesting to analyze before going with recommendations.

- a. **Task** occurs when team members disagree on the content or process of the task and involve different opinions, ideas or perspectives on how to approach a task or solve a

problem (Jehn, 1995). It can be good as it brings out different ideas but if not managed well, it generally harms the team (Santos, Uitdewilligen, and Passos, 2015).

- b. Relationship Conflict is personal or emotional conflict between team members. It is often associated with tensions, friction or personality clashes that are not task related. It is generally bad (Jehn, 1995) (De Dreu & van Vianen, 2001).
- c. Process Conflict is about disagreements on how tasks should be done and may involve disputes on who should do what, who should delegate tasks or how resources should be distributed. If not managed well it can lead to inefficiency and frustration (Jehn, 1997).
- d. Temporal Conflict refers to disputes about timing and scheduling, involving disagreements on how long to spend on certain tasks, the pace of activities or deadlines. Temporal conflict usually disrupts coordination and planning within the team (Mohammed & Nadkarni, 2011) (Standifer, et al., 2015).

4. RELATION BETWEEN STRATEGIC CONSENSUS AND S&OP PROCESS.

Considering the title of the current research and consequently its focus, it becomes fundamental, at this point, to link Strategic Consensus and S&OP Process. How?

Strategic Consensus is fundamental for the success of the Sales and Operations Planning Process, because when top, middle, and operational management are aligned on the organization's key goals, the S&OP Process itself becomes a more effective tool for achieving the organizational objectives. The alignment fosters communication and coordination among departments while reducing conflicting priorities and setting a more collaborative workplace, hence minimizing the inefficiencies and enabling smooth decision-making.

Kenneth and Christopher (1999), in the article *Strategic Consensus in Operations Strategy* published in the Journal of Operations Management, argue that the absence of Strategic Consensus leads to fragmented decision-making, where each department may pursue conflicting goals. For example, while Sales might declare an increase in revenue as their primary objective, Operations would retaliate by suggesting cost control, and Finance would argue that maximization of profitability should be its primary goal instead. With the divergence of priorities, such could be a hindrance to the S&OP Process, which is based on collaboration among departments to achieve an efficient balance between demand and supply.

In conclusion, studies have revealed that high levels of Strategic Consensus allow Sales & Operations Planning (S&OP)-organizations to respond better to shifts in the market by maintaining coordinated supply chain activities to avoid production delays. In other words,

Strategic Consensus is what provides uniform direction to all departments. In cultivating its strength, organizations thrive in planning capabilities that facilitate the S&OP process, creating greater responsiveness and flexibility for improved long-term planning and risk management. Thus, it becomes a key driver in maximizing the S&OP process potential and long-term viability (Boyer & McDermott, 1999).

5. SHARED MENTAL MODELS AS THE SOLUTION AND CONCLUSIONS.

Mental Models are organized knowledge structures that allow individuals to interact with their environment. Specifically, they help people predict and explain the behavior of the world, recognize relationships among components, and anticipate what might occur next (Rouse & Morris, 1986). Mental models allow people to also infer, predict, make sense of things, and to some extent to have some experiences indirectly. In other words, Mental Models have three functions: to interpret, understand, and predict environmental events (Johnson-Laird, 1983).

In team settings, Shared Mental Models (SMMs) are crucial for enabling team members to coordinate effectively and anticipate each other's actions. For teams to adapt successfully, members must predict what their colleagues will do and what resources or support they will require. Thus, SMMs allow team members to utilize their well-structured knowledge to take actions that are aligned and coordinated with those of their teammates (Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2000). According to Stout, Cannon-Bowers, and Salas (1996), when team members communicate freely, the reliance on SMMs decreases because team members are able to discuss strategies as they arise. However, under circumstances of high workload, time pressure, or limited communication, SMMs become essential to team performance by allowing members to predict the actions and the needs of their teammates.

Cannon-Bowers et al. (1993) proposed that there is not just one SMM among team members. Instead, complex tasks require Multiple Mental Models to be shared. Klimoski and Mohammed (1994) argued that Multiple Mental Models often coexist among team members.

In general, Shared Mental Models are categorized into four primary types explained below, also underlining the connection between them and the collaboration across various functional areas within the S&OP context (Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2000).

- a. Technology/Equipment Model focuses on understanding the functioning of tools or equipment, including their operations, limitations, and potential failures. The model

tends to be stable due to its technical nature, ensuring that all team members share a clear understanding of systems like Forecasting Platforms or Inventory Management Tools, preventing planning errors.

- b. Job/Task Model involves knowledge of how tasks are performed, including strategies, procedures, and contingencies, which is crucial when task predictability and standardization are low. It helps improve coordination in meeting Demand Forecasts, creating Production Schedules, or adjusting Supply Chain Strategies.
- c. Team Interaction Model emphasizes how the team interacts, including roles, responsibilities, and communication patterns. It ensures that different departments, such as Sales, Operations, and Finance, collaborate effectively, preventing miscommunication and conflicting priorities.
- d. Team Member Model involves understanding teammates' skills, preferences, and tendencies, helping to adjust behaviors to improve coordination. The model enhances Task Delegation and Adaptability to changes in demand or supply.

Moreover, the role of Shared Mental Models is closely connected to achieving Strategic Consensus (Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2000). In Dafram S.p.A., it means cross-functional teams not only agree on strategic objectives but also share common cognitive frameworks for interpreting information and making decisions. When teams align their Mental Representations of tasks, technology, and interactions, they minimize the risk of conflicts arising from miscommunication or misaligned priorities. For example, when both Sales and Production Teams have a shared understanding of how to interpret market demand data, the company is able to synchronize Operations more effectively.

To conclude, it is by promoting Shared Mental Models that Dafram S.p.A. could become able to bridge Representational Gaps, to enhance Strategic Consensus, leading to smoother coordination, better decision-making, and fewer operational inefficiencies and misunderstanding, other than making the S&OP more mature.

Let's look at how to promote them practically.

5.1. Practical Recommendations for Dafram S.p.A.

In the analysis of Dafram's corporate context, the proposed approach is grounded in two key studies: Cronin and Weingart (2007), which explores the issue of Representational Gaps among functionally diverse teams, and Tarakci et al. (2014), which demonstrates how targeted interventions significantly improve Strategic Consensus within organizations. In particular, the study by Tarakci et al. (2014) clearly highlights the benefits of a half-day strategic intervention

within a Top Management Team. Before the intervention, the level of Strategic Consensus, measured by the α coefficient, stood at 0.55, reflecting a significant misalignment among team members regarding strategic priorities. After the intervention, designed to foster dialogue and realign priorities, the α coefficient rose to 0.82, demonstrating a substantial and measurable improvement in the level of consensus. The result could be considered particularly relevant for Dafram S.p.A, where the current level of Strategic Consensus is significantly low ($\alpha = 0.42$). Such misalignment is common in organizations with functionally diverse teams, where differences in members' expertise and backgrounds lead to divergent interpretations of the corporate strategy. The phenomenon creates Representational Gaps, which are discrepancies in how teams understand and interpret corporate objectives and tasks, leading to conflicts between different functional groups.

In light of the results from Tarakci et al. (2014), adopting similar strategies in Dafram S.p.A is necessary. The use of the following section practical recommendations and tools could significantly improve internal strategic alignment.

Let's delve into practical recommendations to start addressing both Representational Gaps and Demand Unpredictability.

5.1.1. Promoting Cross-Functional Education.

First of all, each team should develop a basic understanding of the goals and expertise of other teams, facilitating communication and reducing misunderstandings. However, the process must go beyond simply sharing information; it should lead to the development of Shared Mental Models, where teams not only understand each other's tasks and objectives but also how these tasks fit into the company's broader strategy.

For example, Dafram could hold *Cross-Training Workshops* in which different teams undergo joint sessions and explicitly discuss the respective challenges they have met and the general decision-making process. A quarterly workshop in which the Sales Team explains their needs to the Production Team could go a long way toward developing a Shared Mental Model that would enhance cooperation and diminish friction between these two functions.

5.1.2. Creating a Common Language.

Differences in terminology may exacerbate Representational Gaps and hinder the development of SMM. Establishing a common language is essential to reduce misunderstandings and ensure that organization members interpret information in the same way.

Dafram could develop a *Strategic Language Guide* that defines key terms, metrics, and objectives used across the company. The manual would ensure not only to mitigate misperceptions between divisions, but also build consistency in the manner of conveying and

receiving information. Besides, teams could take part in *Mental Mapping Exercises* during workshops, which could tell them to collaboratively sketch out company processes and priorities. The exercise would bring the Mental Models of each function to the fore and allow differences to be reconciled.

5.1.3. Developing a Shared Strategic Vision.

Achieving Strategic Consensus is difficult without a shared understanding of company goals. However, to be truly effective, the shared vision must be built on Shared Mental Models across functions. When team members understand how their specific function contributes to the broader company objectives, achieving consensus becomes easier.

Dafram could host *Monthly Strategic Planning Workshops*, where each department actively participates in defining company priorities and clarifying how their goals support the overall strategy. During these sessions, it becomes crucial to spend time clarifying Shared Mental Models across departments, ensuring that everyone shares a common understanding of how their roles integrate with others.

5.1.4. Supporting Constructive Dialogue through Shared Mental Models.

Constructive dialogue is more effective when teams share the same Mental Models. When all team members have a shared cognitive framework regarding tasks and strategic priorities, it becomes easier to discuss differences of opinion and resolve conflicts productively.

Dafram could implement facilitated *Feedback Sessions*, where teams confirm if they are interpreting strategic information in the same way. During these sessions, moments of mental alignment could help resolve misunderstandings before they evolve into major conflicts.

5.1.5. Incentivizing Collaboration through Shared Mental Models.

Cross-functional collaboration is key to enhancing and maintaining Shared Mental Models. When teams are incentivized to work together, they are more likely to share information and develop a common understanding of processes and strategic priorities. Incentivizing collaboration not only helps improve SMMs but also encourages continuity over time.

Dafram could restructure its *Incentive System* to reward not only individual department achievements but also how well teams collaborate with others in developing and maintaining Shared Mental Models. For example, *Cross-Functional Collaboration Feedback* could be included in performance evaluations and bonus criteria, encouraging teams to cooperate.

5.1.6. Visualizing Shared Mental Models with Mapping Tools.

Visualization tools, such as the Multi-Dimensional Scaling Model, could be used to graphically represent SMMs between teams, and could help identify areas of misalignment, facilitating targeted interventions to improve cohesion.

Dafram could use *Mental Mapping Tools* like MDS to graphically depict how various teams interpret the company's strategy and operational processes. It would help identify any differences plan corrective actions to promote alignment.

5.1.7. Strengthening Shared Mental Models with Simulations and What-If Scenarios.

By simulating hypothetical scenarios, teams could test various strategic decisions and observe how their actions intersect with those of other departments. It fosters a deeper understanding of the impact of decisions on the company, reinforcing a shared understanding of strategic processes.

Dafram could use specialized Software such as SAP Strategy Enterprise Management, SAS Forecast Server, Microsoft Analysis Services, or Oracle Data Warehouse to facilitate the creation of *realistic What-If Scenarios*. These tools enable teams to collaboratively assess the impact of external factors, such as regulatory changes or market fluctuations, on operational and strategic decisions. Through such simulations, Dafram could strengthen SMM among teams, highlighting how external changes affect the entire organization. It helps teams build a common understanding of how variations in external factors influence operations and strategic success.

5.1.8. Reinforcing Shared Mental Models through Coaching.

Coaching might help develop and maintain Shared Mental Models by training leaders to guide teams in building and sustaining a shared understanding of objectives and processes. Leaders who are trained effectively facilitate the development of models among their team members.

Dafram could offer *Coaching Sessions for Managers* that focus not only on leadership development but also on facilitating the development of SMMs within their teams. Sessions would ensure that all team members are aligned in terms of both strategic objectives and decision-making processes.

5.1.9. Maintaining Shared Mental Models through Continuous Feedback.

Maintaining Shared Mental Models requires continuous monitoring and realignment, particularly in a dynamic business environment. SMMs must be updated regularly to remain relevant and consistent with emerging business challenges.

Dafram could establish *Regular Strategic Reviews*, during which teams not only monitor their alignment with corporate goals but also check whether their SMMs are still coherent and updated in light of new priorities and operational changes.

By enhancing Shared Mental Models within the approach of Dafram S.p.A, the organization elevates its Strategic Consensus, reduces Representational Gaps, and enhances overall Maturity of its S&OP Process.

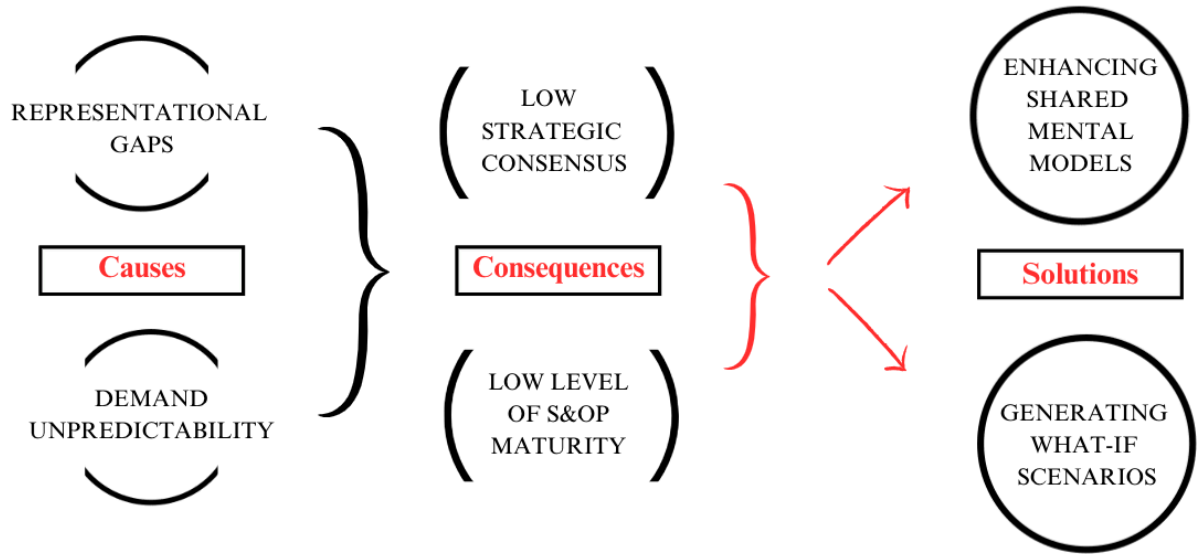
First, enhancing SMMs ensures that all teams, regardless of their functional backgrounds, have a common understanding of the company's objectives, strategic priorities, and workflows. The resulting alignment helps to improve Strategic Consensus by minimizing misunderstandings and conflicts among departments. If all teams share a similar perspective on company objectives, it is easier to negotiate on priorities, thus enhancing the ability of the company to execute its strategy.

In general, developing SMMs would serve to mitigate such Representational Gaps-the cognitive discrepancies in how team members perceive tasks and strategies. Through training, common language, and collaborative tools such as visual mapping and simulations, teams can work towards increasing the alignment of their Mental Models, allowing more effective communication and coordination of workflow across functions. With competing priorities or differences in how they interpret the company's strategy, these team members will have fewer misunderstandings and intergroup conflicts.

Finally, the inclusion of SMMs into Dafram's approach would also add to the Maturity of the S&OP Process. A mature S&OP Process requires effective cross-functional collaboration, shared understanding of demand and supply planning, and an aligned vision of market conditions and operational capacities. This combination of inter-departmental support of SMMs will allow smooth coordination among sales, production, and logistics, achieving not only more efficiency in the S&OP Process but also greater integration into the company's corporate strategic objectives. Greater thinking alignment among teams leads to improved proactive stakeholder response times, whereby the S&OP process moves up the Maturity and Performance scale.

CONCLUSIONS

Figure 53: Addressing Representational Gaps and Demand Unpredictability



Source: Own elaboration using Canva

The current research has highlighted the decisive role of the Sales and Operations Planning Process, stressing how *Representational Gaps* and *Demand Unpredictability* usually contribute to both low Strategic Consensus and underdeveloped Maturity of the S&OP Process. As illustrated in Figure 53, Representational Gaps, along with Demand Unpredictability, are two key drivers of Dafram’s actual operational challenges.

The concept of *Representational Gaps* refers to the differences in how team members conceptualize and understand problems, shaped by individual cognitive frameworks built upon personal knowledge, experiences, and values. Each team member’s interpretation is influenced by their knowledges, leading to divergent perspectives across functional areas. Problem Representation divergences create barriers to proper communication across departments, leading to misunderstandings, coordination problems, and even conflicts. In the specific case of Dafram S.p.A, Representational Gaps are not only the main cause of low Strategic Consensus, but also an obstacle to the enhancement of the S&OP Process Maturity.

Moreover, *Demand Unpredictability* further exacerbates these issues. It is hard for Dafram S.p.A. to determine exactly how much of its product customers purchase, and the company is able to make reasonably accurate forecasts only about 10 days in advance of sales. The extremely small window of time inhibits the organization from acting in advance of market changes, thus minimizing its potential to optimize its S&OP Process.

Therefore, alignment on strategic priorities is crucial to optimize cross-functional communication and collaboration in order to reinforce Strategic Consensus. Contrary to the usual fears, such alignment does not suppress creativity but supports and strengthens teams in their growth and innovation-together motive. Of course, alignment needs to come with balance since extreme strategizing bears the danger of sliding into overthinking and overprocessing, which instead of serving the organization may turn out detrimental to responsiveness and adaptability against market demands.

Summing up, the combination of Demand Unpredictability and Representational Gaps leads to low S&OP Maturity and a lack of Strategic Alignment. Plausibly, the implementation of *Shared Mental Models* and the usage of *What-If Scenarios* may be used to resolve these challenges.

According to researchers Cannon-Bowers, Salas, and Converse (1993), Shared Mental Models play an important role in team coordination and decision making. By enhancing its SMMs, Dafram S.p.A. would bridge these Representational Gaps. The top managers would have a single representation of the most important strategic priorities of the company, improving Strategic Consensus and facilitating cross-functional collaboration.

Additionally, the adoption of What-If Scenarios may help mitigate the impact of Demand Unpredictability, enabling managers to simulate various market conditions and evaluate potential responses. Scenarios provide the required flexibility for decision making and thus enable Dafram to cope with demand swings in a more appropriate way.

A supplementary avenue for enhancing Strategic Consensus could involve measuring Between-Group Strategic Consensus to evaluate how well the strategic priorities of individual departments and teams align with those of Top Management, providing a more detailed and accurate measure of overall organizational alignment. Underpinning this approach with Strategic Consensus Mapping tools would make clear where divergences and convergence points between the different levels occur, thus supporting the more effective implementation of strategic priorities in fostering a coordinated approach.

On October 23, 2024, following the detailed analysis of data collected on Dafram S.p.A., I had the opportunity to present the findings at the company, in presence of the General Director, the Sales Manager, and the two Production Managers. During the meeting, the Top Management Team expressed their surprise at my ability, as an external consultant with an academic background, to understand Dafram S.p.A.'s unique internal dynamics and operational

characteristics so profoundly. Insight into a niche company, unique in its field and a “rare find” in the broader industrial context of the Marche region and central Italy, has been highly valued.

In conclusion, *Representational Gaps* and *Demand Unpredictability* are the primary causes of Dafram’s low *Strategic Consensus* and low *S&OP Maturity*. Bridging gaps through the enhancing of stronger *SMM* and the integration of *What-If Scenarios* into the decision-making process could enable Dafram to improve both operational efficiency and strategic alignment. Furthermore, I suggest Dafram should focus on the practical recommendations discussed, including Cross-Functional Education, the establishment of a Common Language, and the use of Mapping Tools to visualize Shared Mental Models. A further suggestion is to reapply the techniques used in the current research one year from now, after implementing the recommended suggestions, to observe tangible progress. While an external benchmark may not be available, the advice is to become one’s own benchmark and continually strive for self-improvement.

Finally, the study underscores the importance of connecting academic research with real-world business practices. By applying theoretical frameworks to a practical setting, the research offers not only specific solutions but also valuable insights for managers, equipping them with tools to better understand and navigate organizational challenges. Such a bridge between academia and industry enriches both domains: academia benefits from practical validation, and companies gain innovative perspectives and structured approaches to addressing complex issues.

A photo follows, with the General Director of Dafram S.p.A, Nicola Chiavari, and I standing beside a completed ball valve, which had been finalized only few hours earlier, during my most recent visit to the company.

Yes, it has been an enriching and changing experience: a first direct dive into the corporate world in such a dynamic and tangible way. Therefore, I hope it will become a source of inspiration and a cornerstone for my future personal and professional growth.

To all those who supported and guided me throughout the way – my heartfelt thanks.



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APPENDIX (A)



UNIVERSITÀ
DEGLI STUDI
DI PADOVA

SURVEY – S&OP MATURITY & STRATEGIC CONSENSUS

Questo **questionario** è lo strumento di un'indagine sulla Maturity del processo di Sales and Operations Planning, condotta **dall'Università di Padova** (Prof. Andrea Furlan).

Il questionario si compone di una serie di **domande puntuali e domande a scelta multipla** che devono essere risposte avendo in mente lo stabilimento produttivo in cui verranno somministrati gli altri questionari di questa indagine, qualora l'azienda abbia più stabilimenti.

Le risposte che darai saranno **strettamente confidenziali**, non verrà annotato il nome di alcun rispondente e nessuno sarà a conoscenza di ciò che hai scritto, inoltre le informazioni ottenute saranno usate solo a scopi statistici per attività di ricerca ai sensi dell'art.13 del Regolamento UE 2016/679 (Regolamento generale sulla protezione dei dati).

GRAZIE PER LA COLLABORAZIONE!!

A. Cultura organizzativa

1. In quale misura esistono collaborazione, comunicazione e condivisione delle informazioni tra i reparti/funzioni aziendali e con l'esterno?

- ☐ Esiste una cultura a silo: ogni reparto lavora in ottica locale, non comunica con le altre funzioni e le informazioni non vengono condivise ma mantenute all'interno della singola area.
- ☐ Tra i reparti vi è poca comunicazione, le informazioni vengono solo parzialmente condivise, la "cultura della collaborazione" è limitata a poche persone.
- ☐ C'è una buona comunicazione tra i reparti, anche se supportata solo parzialmente da strumenti informativi, ma in generale le informazioni vengono condivise all'interno dell'azienda ed esiste una cultura della "condivisione e collaborazione".
- ☐ La comunicazione all'interno dell'azienda è considerata essenziale ed è supportata da strumenti informativi adeguati: le informazioni vengono condivise sia all'interno che all'esterno (almeno con i

fornitori e client chiave) ed esiste una cultura dell'“integrazione delle informazioni”.

- ☐ Per migliorare le performance di tutta la supply chain l'azienda ha deciso di “orchestrare le informazioni”: la comunicazione, dunque, è vista come essenziale sia all'interno dell'azienda che verso tutti i partner a monte (fornitori) e a valle (clienti) ed è supportata da strumenti informativi adeguati.

2. Le persone in azienda hanno una visione d'insieme, sono orientate ai risultati aziendali e allineate con gli obiettivi strategici?

- ☐ Esiste una cultura a silo per cui ogni reparto tende a perseguire di fatto solo obiettivi locali.
- ☐ I reparti lavorano per obiettivi locali e solo sporadicamente vengono organizzate delle riunioni per cercare degli allineamenti tra aree diverse. Non vi sono momenti specifici di allineamento con gli obiettivi del top management.
- ☐ Le operations hanno degli obiettivi comuni da perseguire, ma non c'è un confronto strutturato con gli obiettivi del top management. Non vi è ancora una visione d'insieme in azienda.
- ☐ Gli attori principali del processo S&OP e il top management collaborano per definire i criteri che guidino l'elaborazione di piani in grado di equilibrare le esigenze di tutte le parti coinvolte. Esiste una visione d'insieme all'interno dell'azienda.
- ☐ Top management e attori principali del processo S&OP collaborano con l'intera supply chain per definire degli obiettivi di ottimizzazione comuni all'interno di una visione d'insieme.

3. In che modo le persone in azienda vengono premiate per il loro operato?

- ☐ Non esistono sistemi di incentivazione.
- ☐ Il risultato aziendale complessivo è l'unico criterio adottato per premiare i collaboratori.
- ☐ Gli obiettivi e i risultati individuali guidano il sistema di premi e incentivi, indipendentemente dal risultato aziendale.
- ☐ Le persone vengono valutate e premiate sulla base dei propri risultati attraverso un metodo strutturato quali-quantitativo e condiviso con un riferimento aziendale.
- ☐ Esiste un sistema a "obiettivi ricchi": le persone vengono valutate e premiate in parte sulla base dei propri risultati in modo quali-quantitativo e in parte sulla base del risultato aziendale complessivo.

B. Struttura organizzativa

4. Quali tra le seguenti affermazioni ritieni sia più in linea con la tua realtà aziendale?

- ☐ Area Sales e area Operations sono mondi distinti, con dialogo e interazione che li limitano allo stretto indispensabile nell'evasione della domanda.
- ☐ Viene incentivata l'interazione fra vendite e produzione, ma non esistono strutture specifiche che operino in senso orizzontale.
- ☐ L'azienda ha creato funzioni specifiche (es.: area Supply Chain) che svolgono un ruolo di mediazione fra esigenze del mercato ed efficienza produttiva.

5. In che misura il top management sponsorizza/incentiva incontri di negoziazione e condivisione tra sales e operations?

- ☐ Non esiste una sponsorship da parte del top management sul processo di S&OP (se esiste, è lasciato alla libera iniziativa dell'area Sales e dell'area Operations).
- ☐ Viene riconosciuta l'importanza del processo di S&OP e il top management si preoccupa di favorire una vi-sione di insieme all'interno dell'azienda.
- ☐ Il top management sponsorizza il processo di S&OP e ha voluto creare una cultura aziendale che ne riconosca il valore strategico non solo per l'azienda, ma anche per tutta la supply chain.

6. La tua azienda ha un processo S&OP?

- ☐ Non esiste un processo formale.
- ☐ Esistono incontri di pianificazione tra lato supply e lato demand ma non formalizzati da un processo specifico (le persone non hanno ruoli e responsabilità definite).
- ☐ Abbiamo un processo S&OP formale e strutturato in cui ruoli e responsabilità sono ben definite.

C. Processo aziendale

7. Quale di queste definizioni rappresenta maggiormente le modalità con le quali la tua azienda svolge il processo di pianificazione della domanda?

- ☐ Ciascuna funzione sviluppa la propria attività ipotizzando un andamento della domanda sulla base della propria sensibilità e delle informazioni raccolte internamente.
- ☐ Non esiste un processo di previsione della domanda, le funzioni utilizzano come riferimento principale un budget delle vendite che potrebbe però non avere un dettaglio di mix prodotto sufficiente per supportare la verifica dei vincoli.
- ☐ Esiste un processo di previsione della domanda formale, in carico a una specifica funzione/ruolo organizzativo (ma non necessariamente utilizzato da tutte le altre funzioni aziendali).
- ☐ La previsione della domanda è in carico a una specifica funzione, il processo viene riconosciuto come fondamentale e tutte le funzioni aziendali sono allineate su quei valori previsionali.
- ☐ Il processo di previsione della domanda rappresenta un'attività fondamentale: non solo tutte le funzioni aziendali sono allineate sui valori elaborati, ma questi vengono condivisi anche con i principali clienti e/o fornitori in ottica collaborativa.

8. Quale di queste definizioni rappresenta maggiormente le modalità con le quali la tua azienda svolge il processo di pianificazione della produzione e degli approvvigionamenti?

- ☐ Non viene sviluppata nessuna verifica dei vincoli di capacità e di disponibilità dei materiali nel medio termine.
- ☐ Viene sviluppata una verifica di capacità nel medio termine basata su numeri aggregati il cui risultato è fortemente legato all'esperienza.
- ☐ Esiste un processo strutturato di verifica della capacità che sulla base del portafoglio e/o delle previsioni sviluppa dei profili di capacità almeno sulle principali risorse critiche.
- ☐ C'è un processo strutturato di verifica della capacità produttiva integrato con la verifica dei principali vincoli di disponibilità dei materiali.
- ☐ La pianificazione della capacità produttiva e la verifica dei principali vincoli di disponibilità dei materiali avvengono regolarmente all'interno di un processo strutturato, che monitora puntualmente

anche la capacità produttiva dei fornitori.

9. Come sono strutturati le riunioni inter-funzionali all'interno dell'organizzazione?

- ☐ Non esistono incontri formali pianificati con regolarità tra le funzioni. Ci sono ovviamente riunioni, ma con-vocati in base alle necessità
- ☐ I meeting non presentano un'agenda e gli input e gli output delle riunioni non sono formali e strutturati. Esiste un'agenda condivisa per le riunioni, che seguono una prassi consolidata.
- ☐ Le decisioni a valle delle riunioni sono formalizzate e c'è poi una verifica delle azioni in carico alle funzioni.
- ☐ L'azienda ha sviluppato prassi condivise per le riunioni, all'interno dei quali le decisioni sono formalizzate, vengono valutati sempre gli scostamenti e gli avanzamenti e ogni team è dunque in grado di concentrare l'attenzione solo sulle situazioni critiche.

10. Quale di queste definizioni rappresenta maggiormente le modalità con le quali la tua azienda svolge il processo S&OP?

- ☐ Non esistono momenti di condivisione strutturati tra le funzioni con l'intento dichiarato di bilanciare la domanda commerciale con i vincoli delle operations.
- ☐ Esistono degli incontri interni, non formali, in cui le funzioni si incontrano per definire azioni di bilanciamento della domanda e offerta, ma l'approccio è principalmente reattivo e gli incontri sono orientati alla risoluzione di urgenze e criticità.
- ☐ Abbiamo un incontro formale con cadenza periodica orientato a bilanciare domanda e offerta, anche se non lo chiamiamo "S&OP".
- ☐ Vengono pianificati dei pre-meeting - sia lato Demand, sia lato Supply - di preparazione all'incontro di S&OP, che avviene con cadenza periodica.
- ☐ Oltre all'incontro di S&OP, a valle di esso viene organizzato un "Executive Meeting" a cui partecipano le direzioni, con l'obiettivo di verificare che le decisioni siano in linea con gli obiettivi strategici aziendali.

D. Strumenti a supporto

11. Quali tra questi strumenti a supporto del processo S&OP (e/o dei processi di pianificazione delle capacità produttiva e dei materiali) vengono utilizzati nella tua azienda?

a. Demand Planning

- | | |
|---|--|
| ☐ E-mail | ☐ Advanced Demand Planning Tool (Machine Learning) |
| ☐ Fogli di calcolo realizzati ad hoc | ☐ Interfaccia collaborativa condivisa con mondo commerciale EDI per la ricezione delle previsioni del cliente |
| ☐ Tabelle ERP (senza sviluppo algoritmico) | |
| ☐ Report di Business Intelligence | |
| ☐ Demand Planning Tool tradizionale | |

b. Supply Chain Planning (Capacity Planning, Material Planning)

- | | |
|--|---|
| ☐ E-mail | ☐ Funzionalità MRP su sistema ERP |
| ☐ Fogli di calcolo ad hoc | ☐ Modulo di pianificazione custom sviluppato ad hoc (su ERP o integrato ad esso) |
| ☐ Fogli di calcolo strutturati ed automatizzati | ☐ Advanced Planning & Scheduling System (APS) |
| ☐ Tabelle ERP (senza sviluppo algoritmico) | ☐ Strumento verticale di settore |
| ☐ Report di Business Intelligence | |

c. S&OP Process

- | | |
|---|--|
| ☐ E-mail | ☐ Modulo specifico di pianificazione S&OP |
| ☐ Fogli di calcolo ad hoc | ☐ Advanced Planning & Scheduling System (APS) |
| ☐ Fogli di calcolo strutturati e automatizzati | ☐ Rough-Cut Capacity System |
| ☐ Report di Business Intelligence | ☐ What-if Analysis Optimization tool |

E. Misura delle performance

d. Quale di queste definizioni è maggiormente affine al metodo di misurazione delle performance legate al processo di pianificazione della domanda?

- ☐ Non esiste un sistema di misurazione ufficiale
- ☐ Vengono svolte attività macroanalisi di vendita come l'analisi delle tendenze e delle misure commerciali
- ☐ Esiste un processo di pianificazione della domanda in cui viene misurata la forecast accuracy.
- ☐ Misuriamo in modo strutturato la forecast accuracy e altre metriche, che utilizziamo regolarmente come driver a supporto delle decisioni e/o come target per le funzioni aziendali.
- ☐ Le misure di forecast accuracy vengono condivise non solo internamente, ma anche esternamente con i principali clienti

e. Quale di queste definizioni è maggiormente affine al metodo di misurazione delle performance legate al processo di pianificazione della produzione e degli approvvigionamenti?

- ☐ Non esiste un sistema di misurazione delle performance produttive e logistiche.
- ☐ Raccogliamo i dati di produttività/efficienza degli impianti e degli stabilimenti produttivi e li utilizziamo regolarmente per prendere decisioni sulla capacità sul breve periodo.
- ☐ Vengono misurate la saturazione dei centri di lavoro e/o risorse critiche e visualizzati i profili di carico per prendere delle decisioni sulla capacità di medio-lungo periodo.
- ☐ Ogni funzione misura i KPI di propria competenza: la saturazione dei centri di lavoro e/o risorse critiche, la disponibilità dei materiali, il livello di servizio offerto ai clienti.
- ☐ Esiste un sistema integrato di KPI che ci consente di verificare puntualmente le performance lungo tutta la supply chain (capacità produttiva, disponibilità, magazzino, livello di servizio) e di individuare subito criticità, cause e correlazioni.

f. Quali tra le seguenti misure/indicatori vengono calcolate e monitorate regolarmente e strutturalmente nella tua azienda?

- | | |
|--|--|
| ☐ Fatturato | ☐ Tempo tra data ordine e data evasione |
| ☐ Giacenza attuale | ☐ Saturazione delle risorse |
| ☐ Quota obsoleti | ☐ Proiezione futura saturazione risorse |
| ☐ Indice di rotazione / copertura | ☐ OEE / Produttività risorse produttive |
| ☐ Quantità/righe di vendita inevase | ☐ Indice disponibilità materiali (mancanti) |
| ☐ Puntualità della delivery | ☐ Proiezione MOL in base al piano attuale |
| ☐ Livello di servizio | |
| ☐ Forecast Accuracy | |

F. Priorità Strategiche

Di seguito ti chiediamo di assegnare un punteggio da 1 a 7 a ciascuna delle seguenti priorità strategiche in base alla loro importanza per la tua azienda. Ogni numero può essere utilizzato una sola volta, con 1 che rappresenta la priorità più bassa e 7 la priorità più alta.

Priorità Strategica	1 – 7
Safety	
Expert Staff	
Strategic Partnership / Reliable Network	
Economic Reliability of Products/Processes	
Organizational Structure	
Risk Management	
Environmental Sustainability	

APPENDIX (B)

	Cultura Organizzativa		
	1. In quale misura esistono collaborazione, comunicazione e condivisione delle informazioni tra i reparti/funzioni aziendali e con l'esterno?	2. Le persone in azienda hanno una visione d'insieme, sono orientate ai risultati aziendali e allineate con gli obiettivi strategici?	3. In che modo le persone in azienda vengono premiate per il loro operato?
ID Respondent			
Respondent 1	La comunicazione all'interno dell'azienda è considerata essenziale ed è supportata da strumenti informativi adeguati: le informazioni vengono condivise sia all'interno che all'esterno (almeno con i fornitori e client chiave) ed esiste una cultura dell'“integrazione delle informazioni”.	Gli attori principali del processo S&OP e il top management collaborano per definire i criteri che guidino l'elaborazione di piani in grado di equilibrare le esigenze di tutte le parti coinvolte. Esiste una visione d'insieme all'interno dell'azienda.	Il risultato aziendale complessivo è l'unico criterio adottato per premiare i collaboratori.
Respondent 2	Tra i reparti vi è poca comunicazione, le informazioni vengono solo parzialmente condivise, la “cultura della collaborazione” è limitata a poche persone.	Le operations hanno degli obiettivi comuni da perseguire, ma non c'è un confronto strutturato con gli obiettivi del top management. Non vi è ancora una visione d'insieme in azienda.	Le persone vengono valutate e premiate sulla base dei propri risultati attraverso un metodo strutturato quali-quantitativo e condiviso con un riferimento aziendale.
Respondent 3	La comunicazione all'interno dell'azienda è considerata essenziale ed è supportata da strumenti informativi adeguati: le informazioni vengono condivise sia all'interno che all'esterno (almeno con i fornitori e client chiave) ed esiste una cultura dell'“integrazione delle informazioni”.	Gli attori principali del processo S&OP e il top management collaborano per definire i criteri che guidino l'elaborazione di piani in grado di equilibrare le esigenze di tutte le parti coinvolte. Esiste una visione d'insieme all'interno dell'azienda.	Esiste un sistema a “obiettivi ricchi”: le persone vengono valutate e premiate in parte sulla base dei propri risultati in modo quali-quantitativo e in parte sulla base del risultato aziendale complessivo.
Respondent 4	Tra i reparti vi è poca comunicazione, le informazioni vengono solo parzialmente condivise, la “cultura della collaborazione” è limitata a poche persone.	Gli attori principali del processo S&OP e il top management collaborano per definire i criteri che guidino l'elaborazione di piani in grado di equilibrare le esigenze di tutte le parti coinvolte. Esiste una visione d'insieme all'interno dell'azienda.	Esiste un sistema a “obiettivi ricchi”: le persone vengono valutate e premiate in parte sulla base dei propri risultati in modo quali-quantitativo e in parte sulla base del risultato aziendale complessivo.
Respondent 5	La comunicazione all'interno dell'azienda è considerata essenziale ed è supportata da strumenti informativi adeguati: le informazioni vengono condivise sia all'interno che all'esterno (almeno con i fornitori e client chiave) ed esiste una cultura dell'“integrazione delle informazioni”.	Top management e attori principali del processo S&OP collaborano con l'intera supply chain per definire degli obiettivi di ottimizzazione comuni all'interno di una visione d'insieme.	Esiste un sistema a “obiettivi ricchi”: le persone vengono valutate e premiate in parte sulla base dei propri risultati in modo quali-quantitativo e in parte sulla base del risultato aziendale complessivo.
Respondent 6	La comunicazione all'interno dell'azienda è considerata essenziale ed è supportata da strumenti informativi adeguati: le informazioni vengono condivise sia all'interno che all'esterno (almeno con i fornitori e client chiave) ed esiste una cultura dell'“integrazione delle informazioni”.	Gli attori principali del processo S&OP e il top management collaborano per definire i criteri che guidino l'elaborazione di piani in grado di equilibrare le esigenze di tutte le parti coinvolte. Esiste una visione d'insieme all'interno dell'azienda.	Esiste un sistema a “obiettivi ricchi”: le persone vengono valutate e premiate in parte sulla base dei propri risultati in modo quali-quantitativo e in parte sulla base del risultato aziendale complessivo.
Respondent 7	C'è una buona comunicazione tra i reparti, anche se supportata solo parzialmente da strumenti informativi, ma in generale le informazioni vengono condivise all'interno dell'azienda ed esiste una cultura della “condivisione e collaborazione”.	Gli attori principali del processo S&OP e il top management collaborano per definire i criteri che guidino l'elaborazione di piani in grado di equilibrare le esigenze di tutte le parti coinvolte. Esiste una visione d'insieme all'interno dell'azienda.	Esiste un sistema a “obiettivi ricchi”: le persone vengono valutate e premiate in parte sulla base dei propri risultati in modo quali-quantitativo e in parte sulla base del risultato aziendale complessivo.
Respondent 8	C'è una buona comunicazione tra i reparti, anche se supportata solo parzialmente da strumenti informativi, ma in generale le informazioni vengono condivise all'interno dell'azienda ed esiste una cultura della “condivisione e collaborazione”.	Le operations hanno degli obiettivi comuni da perseguire, ma non c'è un confronto strutturato con gli obiettivi del top management. Non vi è ancora una visione d'insieme in azienda.	Le persone vengono valutate e premiate sulla base dei propri risultati attraverso un metodo strutturato quali-quantitativo e condiviso con un riferimento aziendale.
Respondent 9	C'è una buona comunicazione tra i reparti, anche se supportata solo parzialmente da strumenti informativi, ma in generale le informazioni vengono condivise all'interno dell'azienda ed esiste una cultura della “condivisione e collaborazione”.	Le operations hanno degli obiettivi comuni da perseguire, ma non c'è un confronto strutturato con gli obiettivi del top management. Non vi è ancora una visione d'insieme in azienda.	Esiste un sistema a “obiettivi ricchi”: le persone vengono valutate e premiate in parte sulla base dei propri risultati in modo quali-quantitativo e in parte sulla base del risultato aziendale complessivo.

	Struttura Organizzativa			
	4. Quali tra le seguenti affermazioni ritieni sia più in linea con la tua realtà aziendale?	5. In che misura il top management sponsorizza/incentiva incontri di negoziazione e condivisione tra sales e operations?	6. La tua azienda ha un processo S&OP?	
ID Rispondent				
Respondent 1	Area Sales e area Operations sono mondi distinti, con dialogo e interazione che li limitano allo stretto indispensabile nell'evasione della domanda.	Viene riconosciuta l'importanza del processo di S&OP e il top management si preoccupa di favorire una visione di insieme all'interno dell'azienda.	Esistono incontri di pianificazione tra lato supply e lato demand ma non formalizzati da un processo specifico (le persone non hanno ruoli e responsabilità definite).	
Respondent 2	Area Sales e area Operations sono mondi distinti, con dialogo e interazione che li limitano allo stretto indispensabile nell'evasione della domanda.	Viene riconosciuta l'importanza del processo di S&OP e il top management si preoccupa di favorire una visione di insieme all'interno dell'azienda.	Non esiste un processo formale.	
Respondent 3	L'azienda ha creato funzioni specifiche (es.: area Supply Chain) che svolgono un ruolo di mediazione fra esigenze del mercato ed efficienza produttiva.	Viene riconosciuta l'importanza del processo di S&OP e il top management si preoccupa di favorire una visione di insieme all'interno dell'azienda.	Non esiste un processo formale.	
Respondent 4	L'azienda ha creato funzioni specifiche (es.: area Supply Chain) che svolgono un ruolo di mediazione fra esigenze del mercato ed efficienza produttiva.	Viene riconosciuta l'importanza del processo di S&OP e il top management si preoccupa di favorire una visione di insieme all'interno dell'azienda.	Non esiste un processo formale.	
Respondent 5	Viene incentivata l'interazione fra vendite e produzione, ma non esistono strutture specifiche che operino in senso orizzontale.	Il top management sponsorizza il processo di S&OP e ha voluto creare una cultura aziendale che ne riconosca il valore strategico non solo per l'azienda, ma anche per tutta la supply chain.	Abbiamo un processo S&OP formale e strutturato in cui ruoli e responsabilità sono ben definite.	
Respondent 6	Viene incentivata l'interazione fra vendite e produzione, ma non esistono strutture specifiche che operino in senso orizzontale.	Il top management sponsorizza il processo di S&OP e ha voluto creare una cultura aziendale che ne riconosca il valore strategico non solo per l'azienda, ma anche per tutta la supply chain.	Abbiamo un processo S&OP formale e strutturato in cui ruoli e responsabilità sono ben definite.	
Respondent 7	Viene incentivata l'interazione fra vendite e produzione, ma non esistono strutture specifiche che operino in senso orizzontale.	Viene riconosciuta l'importanza del processo di S&OP e il top management si preoccupa di favorire una visione di insieme all'interno dell'azienda.	Esistono incontri di pianificazione tra lato supply e lato demand ma non formalizzati da un processo specifico (le persone non hanno ruoli e responsabilità definite).	
Respondent 8	Viene incentivata l'interazione fra vendite e produzione, ma non esistono strutture specifiche che operino in senso orizzontale.	Viene riconosciuta l'importanza del processo di S&OP e il top management si preoccupa di favorire una visione di insieme all'interno dell'azienda.	Esistono incontri di pianificazione tra lato supply e lato demand ma non formalizzati da un processo specifico (le persone non hanno ruoli e responsabilità definite).	
Respondent 9	Viene incentivata l'interazione fra vendite e produzione, ma non esistono strutture specifiche che operino in senso orizzontale.	Viene riconosciuta l'importanza del processo di S&OP e il top management si preoccupa di favorire una visione di insieme all'interno dell'azienda.	Abbiamo un processo S&OP formale e strutturato in cui ruoli e responsabilità sono ben definite.	

	Processo Aziendale			
	7. Quale di queste definizioni rappresenta maggiormente le modalità con le quali la tua azienda svolge il processo di pianificazione della domanda?	8. Quale di queste definizioni rappresenta maggiormente le modalità con le quali la tua azienda svolge il processo di pianificazione della produzione e degli approvvigionamenti?	9. Come sono strutturati le riunioni inter-funzionali all'interno dell'organizzazione?	10. Quale di queste definizioni rappresenta maggiormente le modalità con le quali la tua azienda svolge il processo S&OP?
ID Respondent				
Respondent 1	La previsione della domanda è in carico a una specifica funzione, il processo viene riconosciuto come fondamentale e tutte le funzioni aziendali sono allineate su quei valori previsionali.	Viene sviluppata una verifica di capacità nel medio termine basata su numeri aggregati il cui risultato è fortemente legato all'esperienza.	I meeting non presentano un'agenda e gli input e gli output delle riunioni non sono formali e strutturati. Esiste un'agenda condivisa per le riunioni, che seguono una prassi consolidata.	Abbiamo un incontro formale con cadenza periodica orientato a bilanciare domanda e offerta, anche se non lo chiamiamo "S&OP".
Respondent 2	Ciascuna funzione sviluppa la propria attività ipotizzando un andamento della domanda sulla base della propria sensibilità e delle informazioni raccolte internamente.	Viene sviluppata una verifica di capacità nel medio termine basata su numeri aggregati il cui risultato è fortemente legato all'esperienza.	I meeting non presentano un'agenda e gli input e gli output delle riunioni non sono formali e strutturati. Esiste un'agenda condivisa per le riunioni, che seguono una prassi consolidata.	Esistono degli incontri interni, non formali, in cui le funzioni si incontrano per definire azioni di bilanciamento della domanda e offerta, ma l'approccio è principalmente reattivo e gli incontri sono orientati alla risoluzione di urgenze e criticità.
Respondent 3	La previsione della domanda è in carico a una specifica funzione, il processo viene riconosciuto come fondamentale e tutte le funzioni aziendali sono allineate su quei valori previsionali.	La pianificazione della capacità produttiva e la verifica dei principali vincoli di disponibilità dei materiali avvengono regolarmente all'interno di un processo strutturato, che monitora puntualmente anche la capacità produttiva dei fornitori.	L'azienda ha sviluppato prassi condivise per le riunioni, all'interno dei quali le decisioni sono formalizzate, vengono valutati sempre gli scostamenti e gli avanzamenti e ogni team è dunque in grado di concentrare l'attenzione solo sulle situazioni critiche.	Abbiamo un incontro formale con cadenza periodica orientato a bilanciare domanda e offerta, anche se non lo chiamiamo "S&OP".
Respondent 4	Esiste un processo di previsione della domanda formale, in carico a una specifica funzione/ruolo organizzativo (ma non necessariamente utilizzato da tutte le altre funzioni aziendali).	La pianificazione della capacità produttiva e la verifica dei principali vincoli di disponibilità dei materiali avvengono regolarmente all'interno di un processo strutturato, che monitora puntualmente anche la capacità produttiva dei fornitori.	Le decisioni a valle delle riunioni sono formalizzate e c'è poi una verifica delle azioni in carico alle funzioni.	Abbiamo un incontro formale con cadenza periodica orientato a bilanciare domanda e offerta, anche se non lo chiamiamo "S&OP".
Respondent 5	La previsione della domanda è in carico a una specifica funzione, il processo viene riconosciuto come fondamentale e tutte le funzioni aziendali sono allineate su quei valori previsionali.	Viene sviluppata una verifica di capacità nel medio termine basata su numeri aggregati il cui risultato è fortemente legato all'esperienza.	I meeting non presentano un'agenda e gli input e gli output delle riunioni non sono formali e strutturati. Esiste un'agenda condivisa per le riunioni, che seguono una prassi consolidata.	Oltre all'incontro di S&OP a valle di esso viene organizzato un "Executive Meeting" a cui partecipano le direzioni, con l'obiettivo di verificare che le decisioni siano in linea con gli obiettivi strategici aziendali.
Respondent 6	La previsione della domanda è in carico a una specifica funzione, il processo viene riconosciuto come fondamentale e tutte le funzioni aziendali sono allineate su quei valori previsionali.	La pianificazione della capacità produttiva e la verifica dei principali vincoli di disponibilità dei materiali avvengono regolarmente all'interno di un processo strutturato, che monitora puntualmente anche la capacità produttiva dei fornitori.	I meeting non presentano un'agenda e gli input e gli output delle riunioni non sono formali e strutturati. Esiste un'agenda condivisa per le riunioni, che seguono una prassi consolidata.	Abbiamo un incontro formale con cadenza periodica orientato a bilanciare domanda e offerta, anche se non lo chiamiamo "S&OP".
Respondent 7	Esiste un processo di previsione della domanda formale, in carico a una specifica funzione/ruolo organizzativo (ma non necessariamente utilizzato da tutte le altre funzioni aziendali).	C'è un processo strutturato di verifica della capacità produttiva integrato con la verifica dei principali vincoli di disponibilità dei materiali.	L'azienda ha sviluppato prassi condivise per le riunioni, all'interno dei quali le decisioni sono formalizzate, vengono valutati sempre gli scostamenti e gli avanzamenti e ogni team è dunque in grado di concentrare l'attenzione solo sulle situazioni critiche.	Abbiamo un incontro formale con cadenza periodica orientato a bilanciare domanda e offerta, anche se non lo chiamiamo "S&OP".
Respondent 8	Esiste un processo di previsione della domanda formale, in carico a una specifica funzione/ruolo organizzativo (ma non necessariamente utilizzato da tutte le altre funzioni aziendali).	C'è un processo strutturato di verifica della capacità produttiva integrato con la verifica dei principali vincoli di disponibilità dei materiali.	Le decisioni a valle delle riunioni sono formalizzate e c'è poi una verifica delle azioni in carico alle funzioni.	Abbiamo un incontro formale con cadenza periodica orientato a bilanciare domanda e offerta, anche se non lo chiamiamo "S&OP".
Respondent 9	Esiste un processo di previsione della domanda formale, in carico a una specifica funzione/ruolo organizzativo (ma non necessariamente utilizzato da tutte le altre funzioni aziendali).	C'è un processo strutturato di verifica della capacità produttiva integrato con la verifica dei principali vincoli di disponibilità dei materiali.	I meeting non presentano un'agenda e gli input e gli output delle riunioni non sono formali e strutturati. Esiste un'agenda condivisa per le riunioni, che seguono una prassi consolidata.	Abbiamo un incontro formale con cadenza periodica orientato a bilanciare domanda e offerta, anche se non lo chiamiamo "S&OP".

ID Rispondent	Demand Planning						
	E-mail	Fogli di calcolo realizzati ad hoc	Tabelle ERP (senza sviluppo algoritmico)	Report di Business Intelligence	Demand Planning Tool tradizionale	Advanced Demand Planning Tool (Machine Learning)	Interfaccia collaborativa condivisa con mondo commerciale EDI per la ricezione
Respondent 1		X					
Respondent 2	X	X	X				
Respondent 3		X					X
Respondent 4		X					X
Respondent 5		X					
Respondent 6		X					X
Respondent 7		X					
Respondent 8	X	X	X				
Respondent 9		X		X			

ID Rispondent	Strumenti a Supporto								
	Supply Chain Planning								Strumento verticale di settore
	E-mail	Fogli di calcolo ad hoc	Fogli di calcolo strutturati ed automatizzati	Tabelle ERP (senza sviluppo algoritmico)	Report di Business Intelligence	Funzionalità MRP su sistemi ERP	Modulo di pianificazione custom sviluppato ad hoc (es. ERP e strumento ad hoc)	Advanced Planning & Scheduling System (APS)	
Respondent 1				X					
Respondent 2				X					
Respondent 3			X						
Respondent 4		X				X			
Respondent 5						X			
Respondent 6		X							
Respondent 7		X				X	X		
Respondent 8	X	X	X	X		X			
Respondent 9						X	X		

ID Rispondent	Strumenti a Supporto							
	S&OP Process							
	E-mail	Fogli di calcolo ad hoc	Fogli di calcolo strutturati e automatizzati	Report di Business Intelligence	Modulo specifico di pianificazione S&OP	Advanced Planning & Scheduling System (APS)	Rough-Cut Capacity System	What-If Analysis Optimization tool
Respondent 1			X					
Respondent 2	X							
Respondent 3		X						
Respondent 4		X						
Respondent 5		X						
Respondent 6		X						
Respondent 7		X	X					
Respondent 8	X	X						
Respondent 9		X	X					

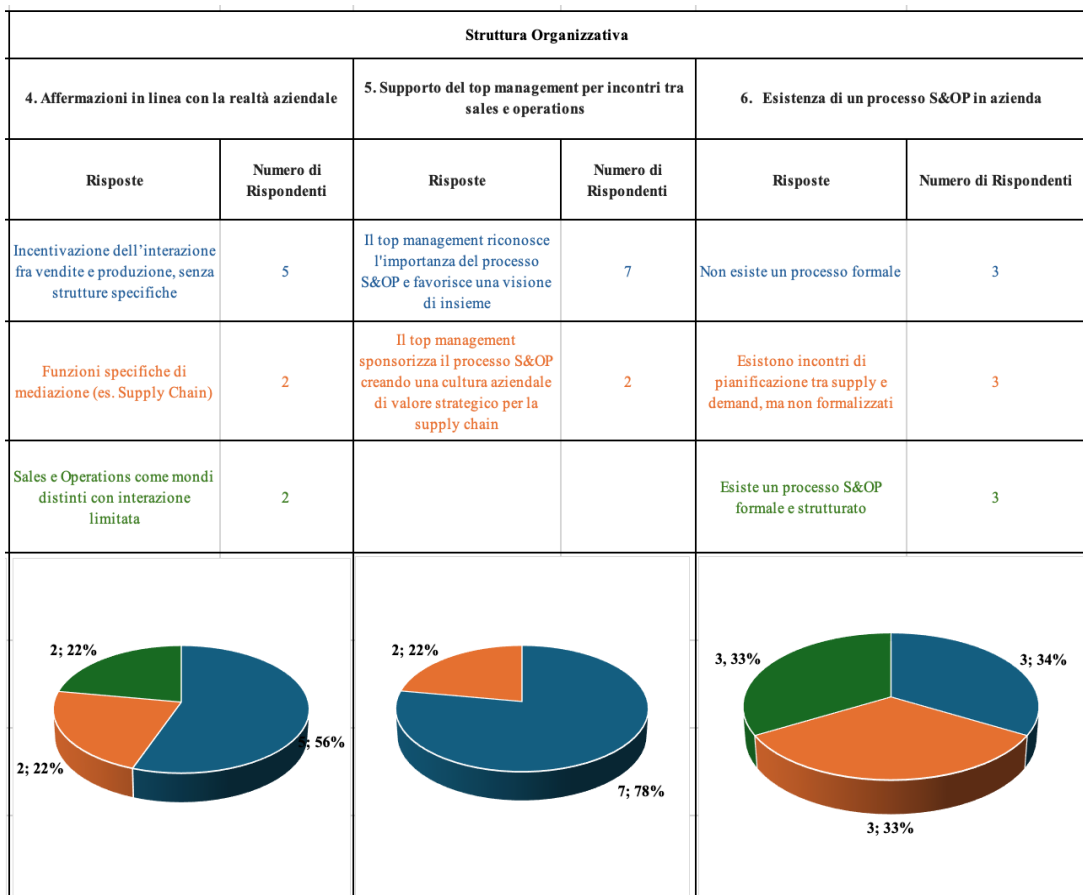
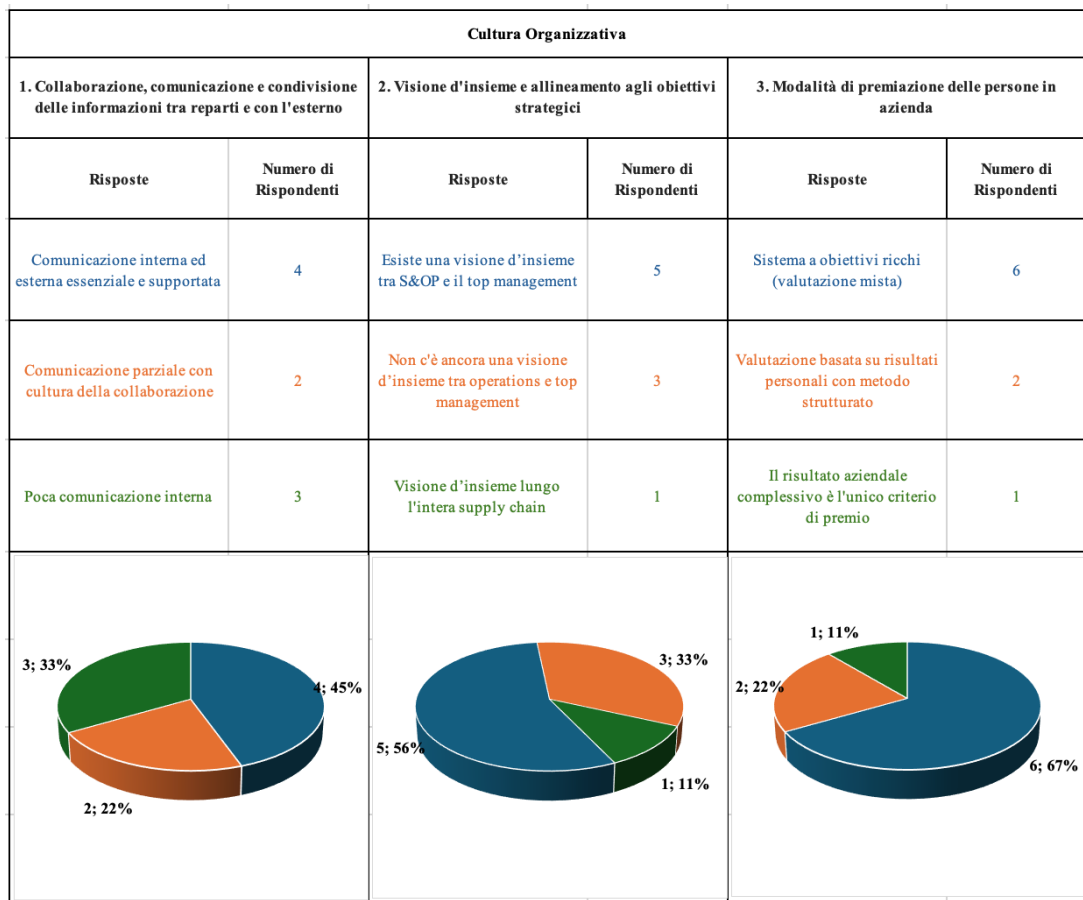
Misura delle Performance		
ID Rispondent	12. Quale di queste definizioni è maggiormente affine al metodo di misurazione delle performance legate al processo di pianificazione della domanda?	13. Quale di queste definizioni è maggiormente affine al metodo di misurazione delle performance legate al processo di pianificazione della produzione e degli approvvigionamenti?
Respondent 1	Vengono svolte attività macro analisi di vendita come l'analisi delle tendenze e delle misure commerciali	Vengono misurate la saturazione dei centri di lavoro e le risorse critiche e visualizzati i pro filli di carico per prendere delle decisioni sulla capacità di medio-lungo periodo.
Respondent 2	Vengono svolte attività macro analisi di vendita come l'analisi delle tendenze e delle misure commerciali	Vengono misurate la saturazione dei centri di lavoro e le risorse critiche e visualizzati i pro filli di carico per prendere delle decisioni sulla capacità di medio-lungo periodo.
Respondent 3	Vengono svolte attività macro analisi di vendita come l'analisi delle tendenze e delle misure commerciali	Esiste un sistema integrato di KPI che ci consente di verificare puntualmente le performance lungo tutta la supply chain (capacità produttiva, disponibilità, magazzino, livello di servizio) e di individuare subito criticità, cause e correlazioni.
Respondent 4	Vengono svolte attività macro analisi di vendita come l'analisi delle tendenze e delle misure commerciali	Esiste un sistema integrato di KPI che ci consente di verificare puntualmente le performance lungo tutta la supply chain (capacità produttiva, disponibilità, magazzino, livello di servizio) e di individuare subito criticità, cause e correlazioni.
Respondent 5	Misuriamo in modo strutturato la forecast accuracy e altre metriche, che utilizziamo regolarmente come driver a supporto delle decisioni e/o come target per le funzioni aziendali.	Esiste un processo strutturato di verifica della capacità che sulla base del portafoglio e/o delle previsioni sviluppa dei pro filli di capacità almeno o sulle principali risorse critiche.
Respondent 6	Vengono svolte attività macro analisi di vendita come l'analisi delle tendenze e delle misure commerciali	Esiste un sistema integrato di KPI che ci consente di verificare puntualmente le performance lungo tutta la supply chain (capacità produttiva, disponibilità, magazzino, livello di servizio) e di individuare subito criticità, cause e correlazioni.
Respondent 7	Misuriamo in modo strutturato la forecast accuracy e altre metriche, che utilizziamo regolarmente come driver a supporto delle decisioni e/o come target per le funzioni aziendali.	Esiste un sistema integrato di KPI che ci consente di verificare puntualmente le performance lungo tutta la supply chain (capacità produttiva, disponibilità, magazzino, livello di servizio) e di individuare subito criticità, cause e correlazioni.
Respondent 8	Misuriamo in modo strutturato la forecast accuracy e altre metriche, che utilizziamo regolarmente come driver a supporto delle decisioni e/o come target per le funzioni aziendali.	Vengono misurate la saturazione dei centri di lavoro e le risorse critiche e visualizzati i pro filli di carico per prendere delle decisioni sulla capacità di medio-lungo periodo.
Respondent 9	Vengono svolte attività macro analisi di vendita come l'analisi delle tendenze e delle misure commerciali	Esiste un sistema integrato di KPI che ci consente di verificare puntualmente le performance lungo tutta la supply chain (capacità produttiva, disponibilità, magazzino, livello di servizio) e di individuare subito criticità, cause e correlazioni.

ID Rispondent	14. Quali tra le seguenti misure/indicatori vengono calcolate e monitorate regolarmente e strutturalmente nella tua azienda?													
	Fatturato	Quota Obsoleti	Indice di Rotazione / Copertura	Quantità/ighe di vendita invase	Puntualità della delivery	Livello di Servizio	Forecast Accuracy	Tempo tra Data Ordine e Data Evazione	Giacenza Attuale	Saturazione delle Risorse	Proiezione Futura Saturazione	OEE/ Produttività Risorse	Indice Disponibilità Materiali	Proiezione MOL in base al piano attuale
Respondent 1	X		X		X		X	X	X			X	X	X
Respondent 2	X			X	X			X	X	X	X	X		X
Respondent 3	X			X	X	X	X	X	X	X		X	X	X
Respondent 4	X		X		X			X	X	X		X	X	X
Respondent 5	X				X				X			X		
Respondent 6	X			X	X	X	X	X	X	X		X	X	X
Respondent 7	X		X	X	X	X		X	X	X	X	X	X	
Respondent 8	X	X	X	X	X		X	X	X	X	X	X	X	X
Respondent 9	X		X		X			X				X	X	

APPENDIX (C)

	Priorità Strategiche (1-7)						
ID Rispondent	a. Safety	b. Expert Staff	c. Strategic Partnership / Reliable Network	d. Economic Reliability of Products/Processes	e. Organizational Structure	f. Risk Management	g. Environmental Sustainability
Respondent 1	4	3	2	7	5	6	1
Respondent 2	7	1	2	4	6	3	5
Respondent 3	1	4	6	7	5	2	3
Respondent 4	1	5	6	7	4	3	2
Respondent 5	7	4	3	2	1	6	5
Respondent 6	5	4	6	7	3	2	1
Respondent 7	5	6	1	7	4	2	3
Respondent 8	7	3	5	2	6	4	1
Respondent 9	6	2	7	5	3	4	1

APPENDIX (D)



Processo Aziendale							
7. Modalità di pianificazione della domanda in azienda		8. Modalità di pianificazione della produzione e degli approvvigionamenti		9. Struttura delle riunioni inter-funzionali nell'organizzazione		10. Modalità di svolgimento del processo S&OP in azienda	
Risposte	Numero di Rispondenti	Risposte	Numero di Rispondenti	Risposte	Numero di Rispondenti	Risposte	Numero di Rispondenti
La previsione della domanda è gestita da una specifica funzione e tutte le funzioni aziendali sono allineate	4	Processo strutturato di verifica della capacità produttiva integrato con i vincoli di disponibilità dei materiali	4	I meeting non presentano un'agenda formale, ma seguono una prassi consolidata	5	Incontro formale con cadenza periodica, orientato a bilanciare domanda e offerta	7
Esiste un processo formale di previsione della domanda, ma non è utilizzato da tutte le funzioni aziendali	4	Verifica di capacità nel medio termine basata su numeri aggregati e legata all'esperienza	3	L'azienda ha sviluppato prassi condivise per le riunioni, senza decisioni formalizzate	2	Incontri non formali, con approccio reattivo orientato a risolvere criticità	1
Ogni funzione ipotizza la propria previsione della domanda	1	Pianificazione della capacità produttiva e verifica dei vincoli di disponibilità dei materiali in un processo strutturato	2	Le decisioni a valle delle riunioni sono formalizzate e verificate	2	Incontro S&OP seguito da un Executive Meeting per allineamento strategico	1

Strumenti a Supporto					
Demand Planning		Supply Chain Planning		S&OP Process	
Risposte	Numero di Rispondenti	Risposte	Numero di Rispondenti	Risposte	Numero di Rispondenti
E-mail	7	Fogli di calcolo ad hoc	6	E-mail	5
Fogli di calcolo realizzati ad hoc	5	Tabelle ERP (senza sviluppo algoritmico)	5	Fogli di calcolo ad hoc	4
Tabelle ERP (senza sviluppo algoritmico)	3	Funzionalità MRP su sistema ERP	4	Fogli di calcolo strutturati e automatizzati	3
Tabelle ERP (senza sviluppo algoritmico) 	3	Funzionalità MRP su sistema ERP 	4	Fogli di calcolo strutturati e automatizzati 	3
Fogli di calcolo realizzati ad hoc 	5	Tabelle ERP (senza sviluppo algoritmico) 	5	Fogli di calcolo ad hoc 	4
E-mail 	7	Fogli di calcolo ad hoc 	6	E-mail 	5

Misura delle Performance					
12. Misurazione delle performance legate alla pianificazione della domanda		13. Misurazione delle performance nella pianificazione di produzione e approvvigionamenti		14. Misure/indicatori monitorati regolarmente in azienda	
Risposte	Numero di Rispondenti	Risposte	Numero di Rispondenti	Risposte	Numero di Rispondenti
Vengono svolte attività di macroanalisi di vendita, come l'analisi delle tendenze e delle misure commerciali	7	Misurazione della saturazione dei centri di lavoro e risorse critiche per decisioni a medio-lungo termine	4	Forecast Accuracy	9
Misurazione strutturata della forecast accuracy e altre metriche	2	Sistema integrato di KPI per la verifica delle performance lungo la supply chain	3	Saturazione delle Risorse	8
		Processo strutturato di verifica della capacità basato su portafoglio/previsioni	1	Giacenza Attuale	8
				Livello di Servizio	7
				Puntualità della Delivery	7
				Proiezione Futura Saturazione Risorse	6
				Proiezione Futura Saturazione Risorse	6

Proiezione Futura Saturazione Risorse	6
Puntualità della Delivery	7
Livello di Servizio	7
Giacenza Attuale	8
Saturazione delle Risorse	8
Forecast Accuracy	9

