eyeon
YEARS AHEAD

STEPS TO RESPONSIVE S&OP

IN THE HIGH TECH INDUSTRY

AN EYEON WHITE PAPER

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1
EXECUTIVE SUMMARY

Today, sales and operations planning (S&OP) is considered as being the key means to execute corporate strategy. A successful S&OP process aligns an organization strategically to execute tactically. The implementation of the S&OP process requires changes to processes, organizations and systems. In this context, EyeOn has introduced 13 building blocks that compresses the path for High Tech and electronics companies towards achieving game-changing benefits by following a step-by-step approach to S&OP success. The building blocks, which are proven to form a solid and successful S&OP, are summarized as follows:

1. Set clear planning objectives and make timely decisions.
2. Make S&OP a regular process with predefined steps.
3. Make relevant information immediately available to all stakeholders.
4. Use statistics to generate the baseline demand forecast.
5. Enrich the baseline demand forecast.
6. Enrich the planning for events.
7. Identify supply issues / risks and propose mitigation scenarios.
8. Optimize the inventory.
9. Anticipate product-portfolio changes with an effective new product-introduction process.
10. Support planning processes with IT tools that suit business dynamics and complexity.
11. Enlist planners with the right skills to improve accuracy.
12. Embark on a journey of continuous improvement.
13. Understand humans.

Figure 1: 13 building blocks for an effective S&OP process.

2 INDUSTRY DYNAMICS: THE DIGITAL TRANSFORMATION

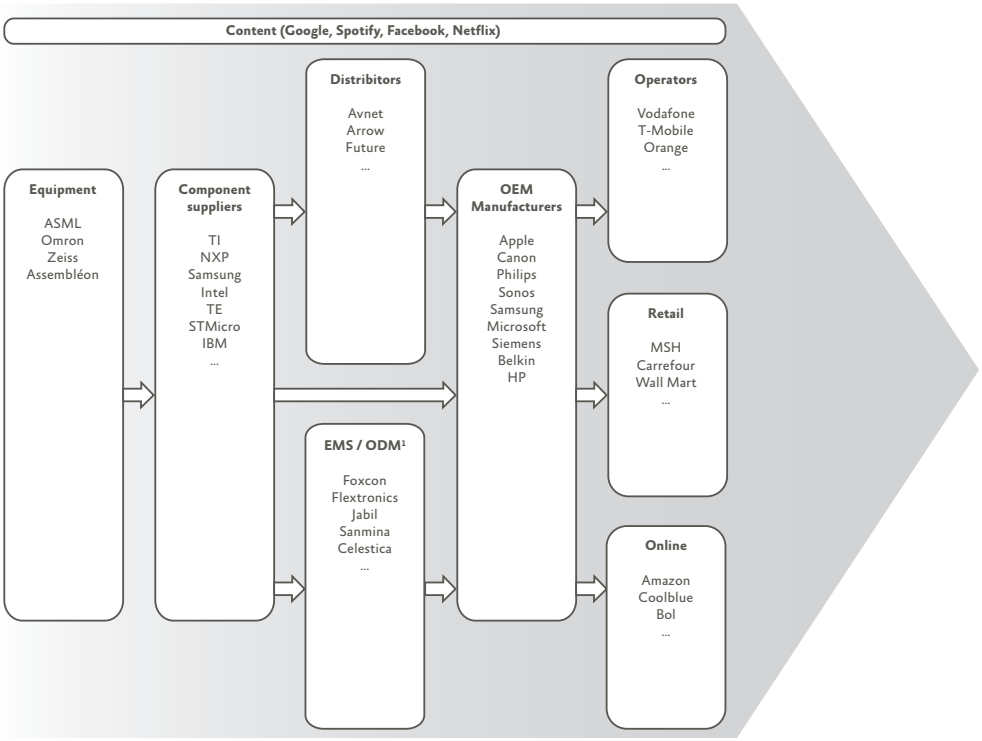
Over the last few decades, smart televisions, mobile phones, computers, tablets and related content have entered the homes of billions of people. The integration of several products into home networking and into connectivity applications is common practice. As a result, many players have entered the electronics value chain. An overview of the value chain and some of its main players is shown in figure 2.

Operations and Supply Chain Managers have worked on improving forecasting and planning processes for decades with varying levels of success (Moon et al., 2003). To balance the customers' requirements with the capabilities of the supply chain, financially and strategically ambitious companies in the High Tech industry operate S&OP processes (Croxton et al., 2002). S&OP is widely accepted as the process to synchronize demand, supply and finance (Grimson, 2007; Feng, 2008; Cacere, 2009). The exact set-up of the S&OP process is driven by market circumstances and supply characteristics. In this section we will elaborate on the drivers for change in the High Tech industry.

DEMAND TRENDS

Many companies across the total High Tech and electronics value chain have difficulties in predicting changes in their demand. Ideally, supply chains do not need forecasts since they are flexible enough to cope with the demand for a unique product in their supply chain at any moment. This reduces the need for a detailed forecast or plan. For example, late stage customization creates the possibility to combine an efficient (push) upstream supply chain, with a responsive (pull) downstream supply chain. Depending on the type of product, this so-called pull-push boundary, or customer order decoupling point (CODP), is positioned differently and offers companies the possibility to create tailored products at the latest moment in time. A good example of this late stage configuration can be found in the smart phones of Motorola. Motorola offers in the US for the colorful Moto X a broad range of customization possibilities, almost all parts can be colored by individual taste. The different components are assembled in the US and shipped directly to the customer, which takes a week. But this concept is not undisputed. Other smartphone manufacturers believe the consumer market works differently. Consumers are not willing to wait for a week for a smart phone, they want to walk out of the shop with a new smart phone in their hands; or order it on line with next-day delivery. This leaves these companies with the challenge to prepare a forecast and plan for the different colors and to produce these products for stock. For countless companies it holds that flexibility is either too expensive or even impossible to organize. In those situations a reliable forecast is an absolute necessity.

The difficulty of generating a reliable demand forecast is explained from a strong demand growth, high demand variability, short product life cycles and a high rate of technological renewal, and new products entering the market, strong price erosion and changing distribution channels.



[1] Electronics manufacturing services (EMS) providers and original design manufacturing (ODM)

Figure 2: The High Tech & electronics value chain.

2 INDUSTRY DYNAMICS: THE DIGITAL TRANSFORMATION

Demand growth

The High Tech industry was relatively insulated from the economic swings of the last few years and has shown growth due to the introduction of low-cost netbooks, tablets, smart phones and other connected devices. With the overall economy recovering, the High-Tech segment seems to be leading the recovery. The revenues for the consumer electronics industry are projected to grow by 3.0 percent in 2015, reaching a new record high of $223.2 billion, according to The U.S. Consumer Electronics Sales and Forecasts.

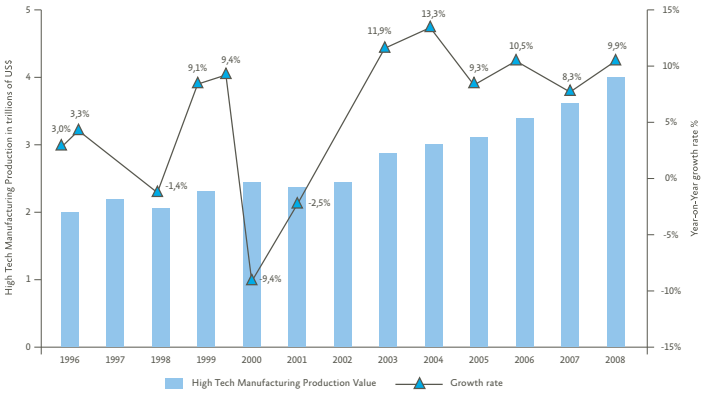


Figure 3: High-Tech manufacturing production.

The consumer electronics forecast projects that new, emerging product categories will grow by 107 percent year-over-year in 2014. These new technology categories, include 3D printers, Bluetooth wireless speakers, convertible PCs, health and fitness devices, smart watches and ultra HD television displays. While the smart phone and tablet sector is becoming increasingly mature, newer technologies are expected to again drive sales volumes. Innovations like 'smart appliances' are an example of the internet of things, which enables white goods and even homes to use connectivity to anticipate consumer demands. This involves products ranging from light switches to regulate light consumption, smart meters to manage in-house electricity consumption and fridges capable of warning about out of date items and automatically generating a replenishment order directly to the retailer of preference.

Demand variability

Research (Wacker and Lummus, 2002) shows that the High-Tech & Electronics industry is among the top-3 industries in terms of demand variability. Demand variability (variation of demand within a given period) combined with cyclical demand (variation of demand over a larger timeframe) results in a very volatile, uncertain demand pattern.

Short product life cycles and technological renewal

The electronics industry finds itself in a constant stage of radical change. Frequent new products and category innovation define and redefine the sector's constantly shifting landscape. No industry is characterized more by the introduction of new products and technologies than the High Tech and electronics industry.

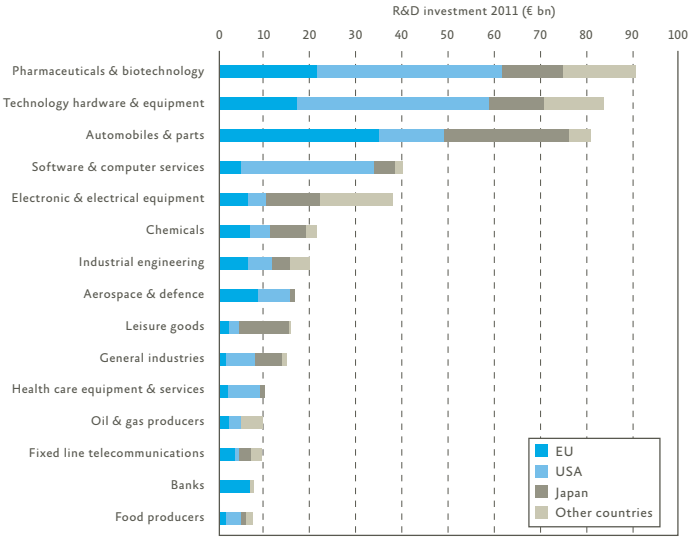
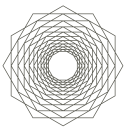


Figure 4: R&D investments in 2011.

In a short amount of time, mobile connected devices including smartphones and tablets have become deep-rooted and indispensable in consumers' lives. The market for these products, now found in millions of households, is exceptionally competitive. At the same time, manufacturers and retailers are hoping wearable electronics will generate new revenue streams.

The so-called 'Internet of Things' is providing another sub sector for High-Tech companies to diversify into. Improving machine-to-machine (M2M) communications is driving the need for connecting more devices to the internet and being able to remotely monitor equipment such as power generators or wind turbines.

2 INDUSTRY DYNAMICS: THE DIGITAL TRANSFORMATION



Margin pressure

Driven by demand for smartphones, tablets and wearable electronics, volume and value sales growth in consumer electronics will remain positive, but prices are expected to continue to fall. With the constant introduction of new products and new features being introduced every few days, price erosion is a serious concern for retailers and manufacturers alike.

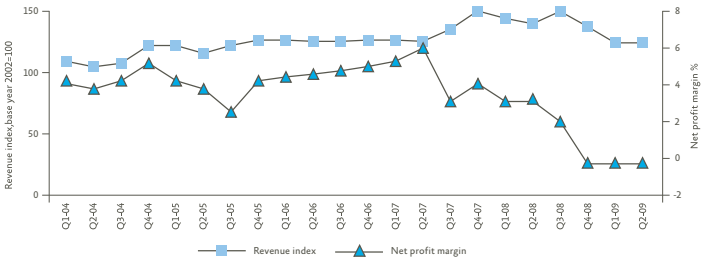


Figure 5: High Tech & electronics industry worldwide revenue and net profit margin trends.

Changing distribution channels

Often, new products are not 1:1 replacements of the traditional products. Applications are combined into new image and sound products. Moreover, hardware is often combined with software, content, services and other hardware offered by third parties in one consumer offering. The radical change in the product offerings also has a huge impact on the consumer trade channels. Products are available via diverse channels, where the internet channel has gained a large presence over the last few years. Strengthened by more general trends in retail, like internationalization and up- scaling, the traditional electronics specialists' channel has nearly disappeared in favor of new, upcoming channels such as hypermarkets, discounters, new specialized channels in digital products arising from early PC retailers, service providers that sell the devices as part of their service and OEMs and retailers selling their products directly through internet.

Consequently, suppliers have to deal with a variety of channels with different pricing, discount structures and demand patterns. Moreover, most new channels are 'promotion driven', which shifts demand patterns from retail stock replenishment to a more batch, promotion-oriented nature.

Consumer electronics manufacturers outsource large parts of their production to Electronics Manufacturing Services (EMS) such as Flextronics, Foxconn and Jabil, thus adding an extra tier in the value chain, and therefore creating a possible bullwhip effect adding more complexity in determining the forecast. The resulting supply-chain fragmentation induces the distortion of information flowing up and down the supply chain, thus causing the so-called bullwhip effect.

New competitors

Giants like Sony, Philips, Panasonic and LG have been displaced by Apple and Samsung, where further new companies like Huawei and Haier from China are trying to upset the industry.

There is an increasing shift for software companies to develop their own hardware. Microsoft was one the first to do this by introducing the XBOX console. By acquiring Nokia, Microsoft has also entered in the mobile phone business. But now Google, Facebook and others are keen to either work with external hardware partners or acquire other companies. For example Motorola Mobility has just released the Moto X phone, but this company is owned by Google.

SUPPLY TRENDS

In situations with high uncertainty, complex value chains will lead to increased vulnerability and will prove to be a business risk. A number of business trends that increase vulnerability to risk in chains can be identified in the High Tech and electronics industry. This section elaborates on the major trends.

The electronics technology that enables devices like tablets, smart phone, and laptops is staggeringly complex. Equally complex for companies in the electronics industry are the global supply chain processes needed to bring products to market. Complexity is compounded by globally sourced components, fast-changing technology, volatile market conditions and ceaseless cost pressure, brutal competition, demanding customers with mission-critical applications, and recently, instability among Chinese suppliers because of rising labor and social insurance costs. Many companies struggle with the problem of trying to remain 'in the driving seat' when many activities are not done in-house and are dispersed around the globe. This is further complicated by the fact that responsibilities are not always unambiguously allocated and are often determined by historical relations between the various parties.

Complex supply chain relations

The electronics technology that enables devices like tablets, smart phone, and lap tops is staggeringly complex. For companies in the electronics industry, equally complex are the global supply chain processes needed to bring products to market. Components are sourced globally, fast-changing technology, volatile market conditions and ceaseless cost pressure, brutal competition, demanding customers with mission-critical applications, and recently, instability among Chinese suppliers because of rising labor and social insurance costs. Companies struggling with the problem of trying to remain 'in the driving seat' when many activities are not done in-house and are dispersed around the globe. This is complicated by the fact that responsibilities are not always unambiguously allocated and often determined by historical relations between the parties.

2 INDUSTRY DYNAMICS: THE DIGITAL TRANSFORMATION

Figure 6: Overview of activities and components used globally to build a laptop computer.

Pressure on capacity utilization

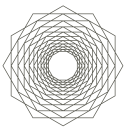
Typically, capital investments are large further up the value chain. For example, semiconductor fabs require many expensive devices to function. Estimates put the cost of building a new fab over one billion U.S. dollars with values as high as $3–4 billion not being uncommon. TSMC invested $9.3 billion in its Fab15 300 mm wafer manufacturing facility in Taiwan (TSMC, 2010). Strategically, the success of manufacturing organizations is tied to the effectiveness of the link between the forecast and the resource allocation plan. Given the time horizon for these capacity decisions and the vast demand uncertainty, scenario planning is compulsory.

Challenging time-to-market and time-to-volume

In a market dominated by continuous technological innovation and short product life cycles, the player launching a new product first, i.e., the player with the shortest time-to-market, has a serious competitive advantage that competitors will find difficult to make up. However, to leverage this head start, speed in upscaling the supply of a new product to levels of mass production is equally important. If a company does not manage this so-called time-to-volume properly, it may find itself left behind empty-handed while the competition capitalizes.

Unfortunately, the early stages of the production of a new product in the High Tech electronics industry are often of an engineering-like nature featuring low yields and long lead- times. This causes significant supply uncertainty. Moreover, it often proves to be very hard to configure a supply chain that enables a reliable mass supply of products after the introduction stage. An example is the launch of imaging features for mobile phones by Motorola, which was seriously hampered by the worldwide shortage of a critical chip (Forbes, 2003). Also Apple had difficulties in satisfying consumer demand for their new MacBook to be launched in April 2015, when new technology like the power-saving retina display, a razor-thin butterfly keyboard, Force-Touch trackpad and a layered-battery-stacking technology with a lower-than-expected yield in any number of areas could affect production quantities.

3 THE OBJECTIVE OF S&OP
4 TACTICS NOT STRATEGY



3 THE OBJECTIVE OF S&OP

To design a qualitatively good planning process, the basic question of why Sales & Operations Planning is necessary in the first place has to be answered. The primary objective of S&OP is to make accurate decisions. The process must be arranged in such a way that relevant information can be shared rapidly, efficiently and transparently within an organization (see figure 7: 'S&OP is about making decisions'). A good forecast is required to make timely and robust decisions on supply and identify potential gaps and risks to reach (strategic) targets.

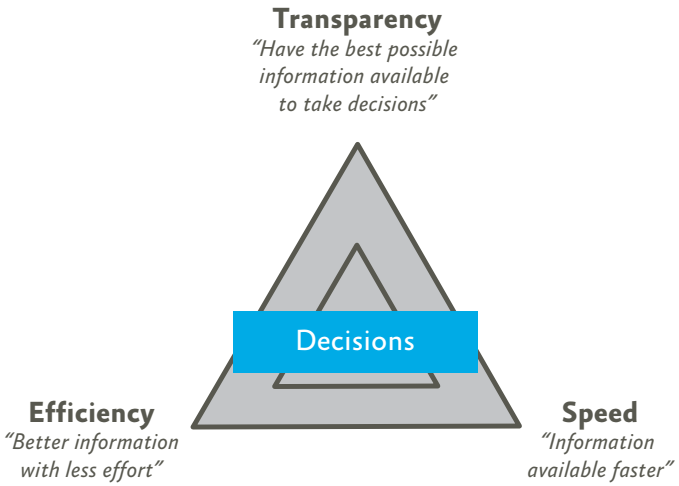


Figure 7: S&OP is about making decisions.

Fast communication of the forecast with all necessary parties involved to support decision making is more important than to try and predict the future with perfect accuracy. A forecast that is 'roughly correct' is better than one which is 'exactly wrong'! Likewise, S&OP should deliver decisions on a robust supply plan rather that a locally optimal plan that is very sensitive to changes.

4 TACTICS NOT STRATEGY

Companies in many industries, including High Tech, recognize the need to improve their forecasting and planning processes in order to succeed and indeed survive. In this respect, the position of tactical planning in the common business classification of planning, i.e., strategic, tactical and operational planning (Gupta and Marana, 2003) is crucial. Decisions on the tactical horizon are related to the question of whether or not the company is still on track to follow its strategy and whether or not corrective (operational) actions are required (see figure 8). This is related to market and price trends, potential business scenarios, customer plans and resource / capacity adaptations.

Tactical planning is the link between operational planning and strategic direction. In a highly volatile market, the outcome of this process largely determines a company's success. Decisions have to be made on resource allocations and whether or not:

- The right future products are in development.
- The right customers / markets are being targeted.
- The right capacities are installed at production sites.
- The right product is planned.
- The right financial value will be returned.

Although critical to success, this planning process is also the most challenging to implement for many companies.

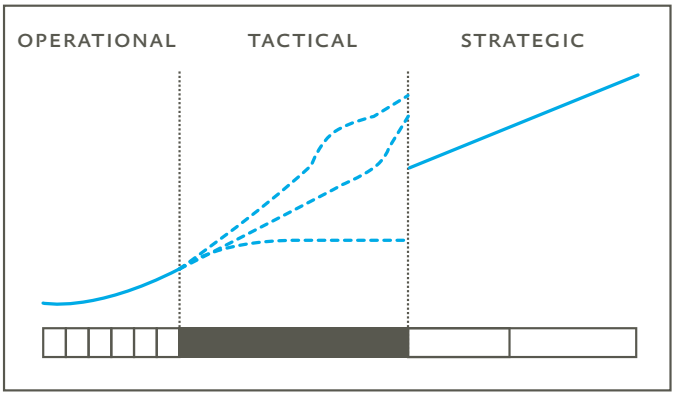


Figure 8: Tactical planning as a link between operational planning and strategic direction.

5
CLEAR OBJECTIVES & TIMELY DECISIONS

BUILDING BLOCK 1 – SET CLEAR PLANNING OBJECTIVES AND DETERMINE WHICH DECISIONS TO MAKE, WHEN

The level at which decisions are made (strategic, tactical, operational) determines the way that the forecasting and planning process is organized. The throughput times of planning processes in many industries, including medical devices, have to be restricted to an absolute minimum. At the same time, key value drivers should be managed in an interdisciplinary way. Companies should therefore define key drivers as a basic starting point for designing the planning process.

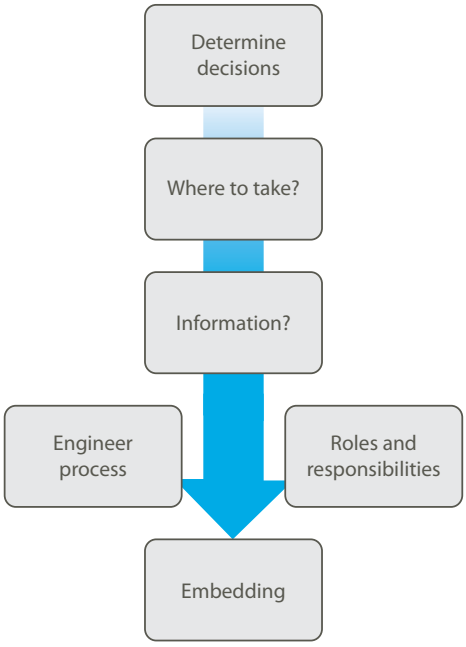


Figure 9: Implementing a responsive forecasting and planning process.

Key questions to be addressed are:

- What decisions have to be made?
- Where will these decisions be taken?
- What information is required to make these decisions?
- Who is doing what and when?

The decision-making structure should be formalized in a cross-functional meeting.

First and foremost, the information required for decision making at consensus meetings needs to be identified. Second, the information source needs to be determined, as well as the person(s) responsible for maintaining the information. Key in this is that only one person is responsible for each data element.

Assign roles and responsibilities, and clearly communicate these to all parties. Accountability leads to increased sales-forecast commitment.

Planning meetings often become discussions about data and its validity, so automate as much as possible. Make sure that data collection is final and complete when decision-making starts, which should be as close as possible to the moment of the decision-making meeting.

When it is known what decisions need to be made, the source of the information and who is assigned to provide it, the detailed process can be designed.

Short planning cycles can only be established when a strict planning calendar is prepared for all activities. This should be adhered to and compliance measured. The effectiveness and value add of every activity should be evaluated in a Plan-Do-Check-Act (PDCA) cycle to drive continuous improvement.

Aggregated planning

For mid-to-long-term decisions, not as much detailed information is required as for the short term, so it is important to aggregate the planning where possible. This is possible within most organizations when the mid-to-long-term decisions are not related to information at SKU (stock keeping unit) level. This gives a number of benefits that translate into a more efficient process:

- Improved long-term forecastability.
- Better alignment with business processes.
- Reduced effort and increased focus for sales & marketing.
- Less data to manage.

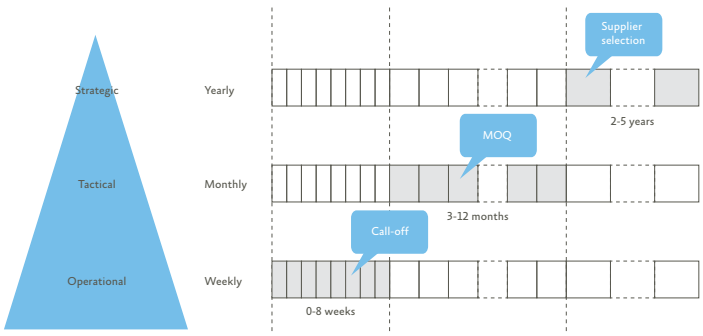
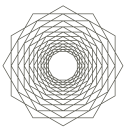


Figure 10: Different horizon, different decisions.

6
REGULAR PROCESS



BUILDING BLOCK 2 – A REGULAR PROCESS WITH PREDEFINED STEPS AND STANDARDIZED DECISION MEETINGS

To achieve a high-quality decision-making process, it is important to fix the decision-making structure and incorporate it into a routine, periodic, cross-functional process that clearly indicates WHO does WHAT WHEN (see figure 11). To break through the buffers (silo effect) between operations and sales, best-in-class companies set up multi-disciplinary teams to manage the cross-functional processes that they have created.

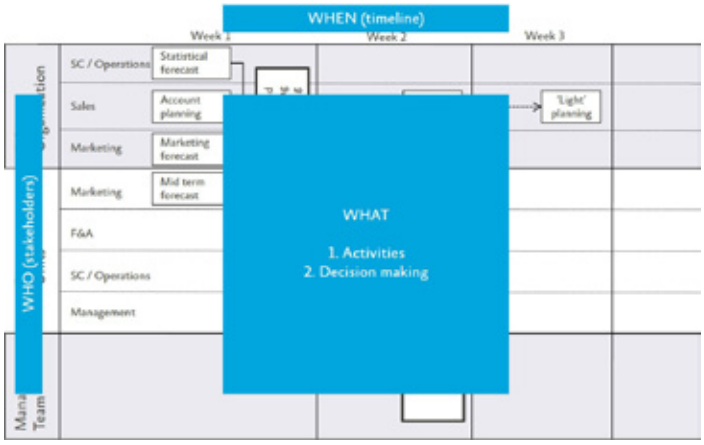


Figure 11: Fixed decision making structure.

A clear guideline is required on who will be responsible for what. Which products to forecast statistically and which to forecast judgmentally should also be clearly defined. This leads to increased involvement and increases the quality of the demand forecast.

Participants in S&OP meetings from the various different functional areas must have decision-making authority. A clear insight into the boundary conditions must be prepared in advance to avoid situations where decisions made at the meeting are merely reversed by senior management after the meeting.

An important success factor for this meeting is the participation – preferably in chairman's role – of a business manager who can enforce decisions in the event of a dispute. He/she should be able to bring a balance when discussing business and interpreting figures and trends during the meeting. Another suggestion is for the sales director to chair a formal 'forecast sign-off meeting'.

A major challenge experienced by many companies is how to engage sales & marketing in the forecasting process and make them take ownership of the forecast (Aertsen and Wouters, 2008). Involving them in the forecasting process is often regarded as challenging, but it is a prerequisite to generating high-quality forecasts. Frequent statements, such as, "My job is selling, not forecasting," clearly show that many sales & marketing people feel that forecasting is simply not part of their job. Unlike supply chain management people, their lack of familiarity with Enterprise Resource Planning (ERP) or advanced forecasting systems makes it even less likely that sales & marketing could produce a good forecast. Requesting an SKU forecast six months ahead would already be difficult. Locating a dedicated demand/supply coordinator in the marketing & sales office is a proven critical success factor.

As a general rule, it is most important that participants use the language of business and reach value-based instead of volume-based decisions. Sales & marketing should only be encouraged only to provide input when and where it really adds value. Moreover, the focus should be maintained on exceptions, issues and risks.

One way of encouraging the participation of sales in forecasting is to prioritize orders for which a forecast is available. Another method that has produced positive results in some companies is to tie sales bonuses to forecast accuracy. This has proven especially effective when used to stress the importance of demand planning during the start-up phase of the process. However, linking performance to the attainment of forecasts does run the risk of tempting the phenomenon known as 'gaming' or 'sandbagging' to the process. This is when executives deliberately understate forecasts to increase the probability they will match or exceed targets.

7
READILY AVAILABLE INFORMATION

BUILDING BLOCK 3 – MAKE RELEVANT INFORMATION IMMEDIATELY AVAILABLE FOR ALL STAKEHOLDERS

Making relevant information available to all supply chain stakeholders brings transparency and therefore clarity to any process, but this is especially valid and indeed crucial in forecasting and planning. Companies often plan exclusively in volumes without translating forecasts into value. And managers are often confronted – not to mention confused – by differences between the forecasts of sales people, the estimates (for the future) of logistics people, and the annual forecasts of the finance department.

The S&OP process needs to move away from the operational process into an integrated business process involving finance and using scenario planning instead of volume-based decisions. The benefits of 'value-based S&OP' and 'one-number planning' need to be made equally clear to all stakeholders. Although supply chain management will be familiar with these, the benefits are not always clear to sales & marketing. However, it must be remembered that the objective is consistent planning. Sales must reflect optimism and the forecasting process should not become a purely mathematical exercise devoid of enthusiasm.

Sharing of information is not limited to the internal organization. Also exchange of relevant information and collaboration with partners outside the company (customers, suppliers) contributes to improved planning accuracy and stability. The level of collaboration within a company on forecasting and planning can be determined using a 'collaboration index' (Simatupang, Sridharan 2005), which measures three important dimensions:

- Information sharing among supply chain partners.
- Decision synchronization among supply chain partners.
- Incentive alignment among supply chain partners.

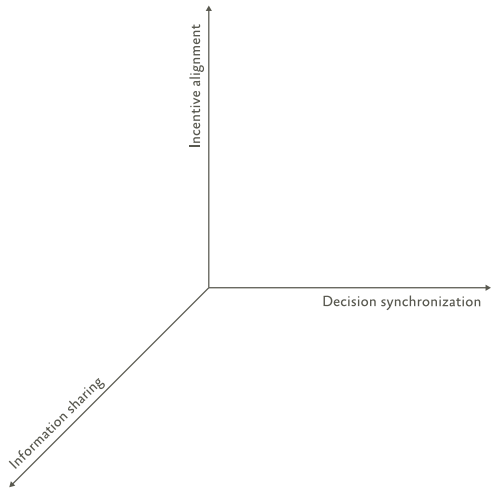


Figure 12: Collaboration index for forecasting and planning.

Combining the collaboration index with the basic forms of collaboration shows the impact of intensified collaboration.

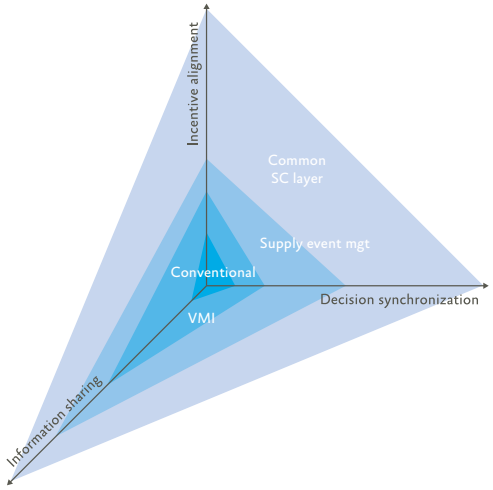


Figure 13: Combined form and index.

Research shows that data sharing between partner companies happens quite a lot, although differences arise in the way it is shared (Van Geel, 2007). The main problem seems to be in finding time (or being disciplined enough) to discuss it, which is the crucial factor in turning data into value-added information. However, it is common to share product information (portfolios and life cycles) unless this is withheld for strategic reasons. The question remains, to what extent can data that is being shared be interpreted and transformed into valuable information to make supply chain decisions?

Decision synchronization, or the level at which supply chain partners mutually decide on important aspects of their forecasting and planning relationship, usually touches areas such as production start-up quantities and timing, ordered-material quantities and timing, priority settings and allocation of capacity alignment. In reality, meetings among supply chain partners are more likely to cover burning issues and how to resolve operational hiccups. Despite general awareness among partners of the benefits that forecasting and planning might bring for end-to-end visibility, there are still reservations about whether it will really work and what pitfalls await.

8 USE OF STATISTICS FOR EFFECTIVE & EFFICIENT PROCESS

BUILDING BLOCK 4 – USE STATISTICS TO GENERATE BASELINE DEMAND FORECAST: EFFICIENT & EFFECTIVE

Forecasting is an essential part of business planning and involves a wide range of functional areas, such as marketing & sales, finance and logistics. A good forecast not only drives an efficient supply chain, it improves service levels and cash flow, and ultimately profitability. Forecasts can be generated using statistics and/or judgement. A statistical forecast bases its projection of the future on results realized in the past by identifying trends, patterns and business drivers within the historic data. Judgmental forecasts, on the other hand, rely on intuitive judgements, opinions and probability estimates. The use of a statistical baseline makes the forecasting process reliable, efficient, transparent, fast and objective. Depending on the possibility to centralize the planning process, a statistical forecast can be prepared very efficiently and eventually leads to a large decrease in planning-organization costs.

To generate a high-quality forecast, the demand signal for a specific product has to be differentiated according to the phase in the product life cycle (new, mature and end-of-life) and the distinction made between whether the sales demand was normal or part of a spike due to promotions, tenders and projects.

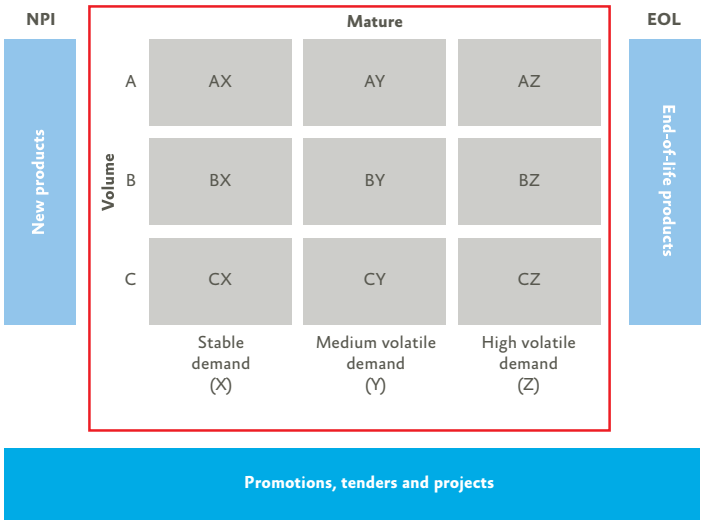


Figure 14: Demand differentiation.

Statistics can be applied to support forecasting in many situations and offer the following benefits:

- Objectivity.
- Insights from the past.
- Fast generation of different forecasts (see below).
- Scenario analysis and comparison.

Baseline forecasting for mature products is based on historical sales data and often uses trend and seasonal models. A high-quality statistical forecast allows companies to focus the enrichment process on those elements that really add value.

Promotion forecasting is based on historical sales and point-of-sales data, and promotion characteristics. A high-quality promotion forecast is generated (generally using regression models) for retailers and their suppliers to improve promotion effectiveness.

New-product forecasting is based on several internal and external data sources, historical introductions, volumes and characteristics, or social-media data. A high-quality new-product forecast can be used to improve the effectiveness of new-product introductions. Statistics (often multinomial logic) regression models can be used to forecast the full life cycle quantity, the initial launch quantity and the ramp-up profile.

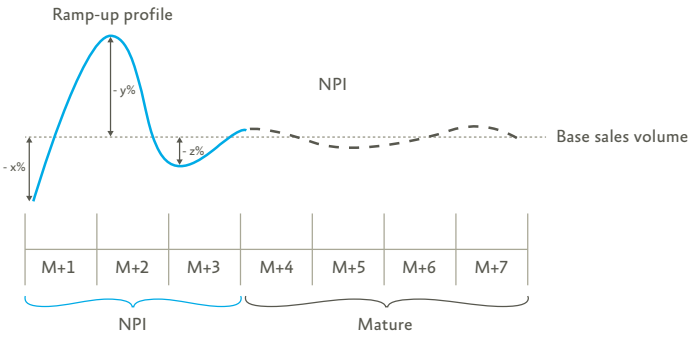


Figure 15: New product forecasting.

Statistically generated forecasts very often show performance that can match or even outperform manually generated forecasts. If required for decision making, a statistical forecast is generated for all SKUs and markets. The aggregation level depends on the level of detail required for decision making / planning (see section 5 under 'Aggregated Planning'). The forecasted outcomes can be used to lend focus, e.g., specific knowledge on promotions and regional or local knowledge. The forecast is then enriched by adding specific knowledge of the local markets and customers.

Outsourcing has been on the agenda of nearly all supply-chain executives for the past decade. After all, third-party logistics and third-party manufacturing have enabled companies to focus attention on core competencies such as research, product design and marketing.

8 USE OF STATISTICS
9 BASELINE ENRICHMENT

Outsourcing of the forecasting function is proving to be an increasingly popular option as companies continue to seek ways of improving their forecasting accuracy. There are multiple advantages to forecast outsourcing:

- Availability of specialized knowledge.
- Fast implementation – shortens time to value.
- Eliminates implementation risks.
- Economies of scale means lower costs.
- Continuous improvement due to investment in new technologies and skills.
- True, collaborative forecasting due to independent information broker.
- Best practice sharing.

The bottom line is that a specialist outsider delivers the best possible statistical forecast in terms of accuracy, efficiency and speed.

9 BASELINE ENRICHMENT

BUILDING BLOCK 5 – ENRICH THE BASELINE DEMAND FORECAST: FOCUS ONLY ON WHERE IT ADDS VALUE

When products are forecasted in several different ways, good product categorization is essential to provide the right focus, namely, where it adds the most value. This is the key to increasing planning efficiency and effectiveness – by spending available time and resources in the best way possible.

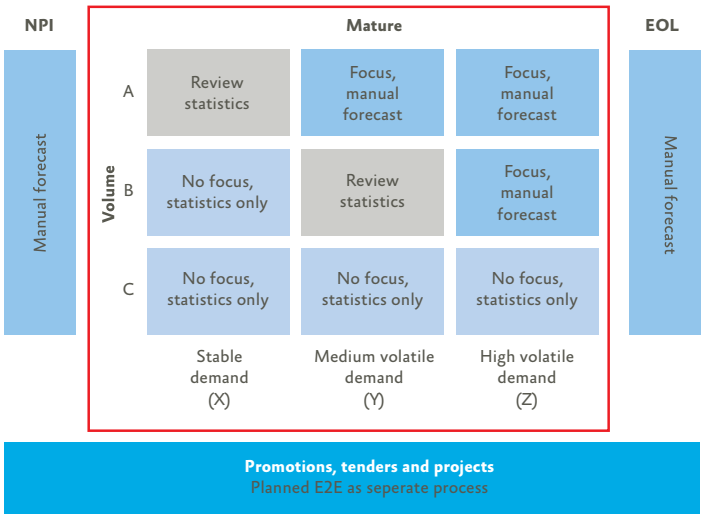


Figure 16: Baseline demand forecast enrichment.

In the context of the High Tech industry, basic categorization should be differentiated according to the demand characteristics. For instance, high-volume products with highly volatile demand will be very difficult to forecast statistically, but they still require focus in order to ensure that demand is met.

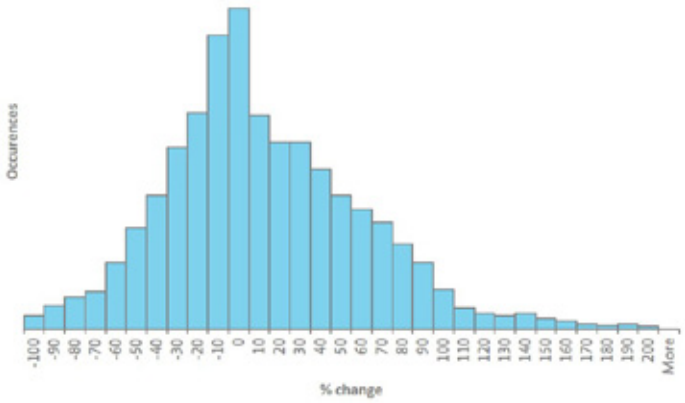
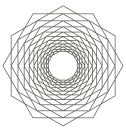


Figure 17: Many small adjustments - very few large adjustments (Goodwin 2010).

A differentiated approach supports demand planners in focusing their planning activities where it adds most value. Research (Fildes, 2009) has revealed that in many companies, planners spend the majority of their time on small (and often irrelevant) plan adjustments. By making use of product characterization, they can focus their efforts on those products where human judgement is required, as the use of statistics will most likely not result in an accurate forecast.

10
EVENT-PLANNING ENRICHMENT



BUILDING BLOCK 6 – ENRICH PLANNING FOR EVENTS, PROMOTIONS, TENDERS AND PROJECTS

It is necessary to enrich the planning for a successful outcome in the case of events like promotions and projects. In most cases promotions are either fully accepted or not. A huge part of the full requirements needs to be met in the short term, leading to large spikes in demand. It is therefore essential that the management process facilitates explicit decisions about the risk of each promotion.

A first prerequisite for a good promotion-management process is the separate capture of the promotions in the actuals and forecast. In this way they can be excluded from the regular forecasting process and form a focused input to the promotion demand-management process.

Promotions are to found in different sorts and shapes. As shown in the figure below for each specific promotion type a specific process has to be defined.

Promotion category	Installations	Intake Promotion	Article Group Promotion
	Loading to support marketing campaign	Loading to support new products	Marketing campaign for full product range
Entered outside x weeks lead-time	• Fixed quantity • Minimum of 90% of promotion quantity confirmed by customer 16 weeks in advance	• Fixed quantity • Minimum of 75% of promotion quantity confirmed by customer 16 weeks in advance	• No fixed quantities • Only high volume products planned
	Complete product portfolio	Limited Promotion Portfolio	Limited Promotion Portfolio
Entered inside x weeks lead-time	NA	Fixed and confirmed quantity	See above (based on historical lift factors)
	NA	Complete product portfolio	Complete product portfolio
	Planned by process (MTO)		*Planned by lift factor (MTS)*

Example

Figure 18: Promotions in different sorts and shapes.

A good promotion planning process differs from the normal statistical forecasting process as follows:

1. Promotion demand is captured separately.
2. Financial assessment of potential bids.
3. An explicit decision to enter a promotion is made.
4. Explicit risk decision.
5. Promotion-based follow-up of actuals versus forecast.

The time-phased dynamics can be managed by having the detailed forecast together with the aggregated initial forecast in one view. The risk decisions are made for the bids that will end in the short term. Mid-to-long-term capacity and procurement decisions can be made using the development of overall requirements, as compared with the initial forecast.

11 ROBUST SUPPLY
12 INVENTORY OPTIMIZATION

11 ROBUST SUPPLY

BUILDING BLOCK 7 – IDENTIFY SUPPLY ISSUES & RISKS AND PROPOSE MITIGATION SCENARIOS

Concerns about material shortages are not trivial. Potentially, disruptions in supply of materials can come from many corners: quality and / or compliance issues, fires, liquidations and natural disasters, to name a few. Increased globalization of the supply chain and reliance on outsourced components and raw materials increase the need for vigilance on the part of electronics. Both in the EU and the US, electronics suppliers have a full legal responsibility for the products and services they sell.

Risk management
Findings at an EyeOn-organized risk-management conference highlighted the following top-five risks as being uppermost in the minds of the companies polled:

1. Shortages in materials.
2. Unreliable production capacity on supplier's side.
3. Sudden material price increases.
4. Selling-price reductions due to competitive pressure.
5. Unforeseen changes in customer demand.

To manage risks, scenario planning has to be used. Depending on the source of risk different of strategies can be applied (see figure below).

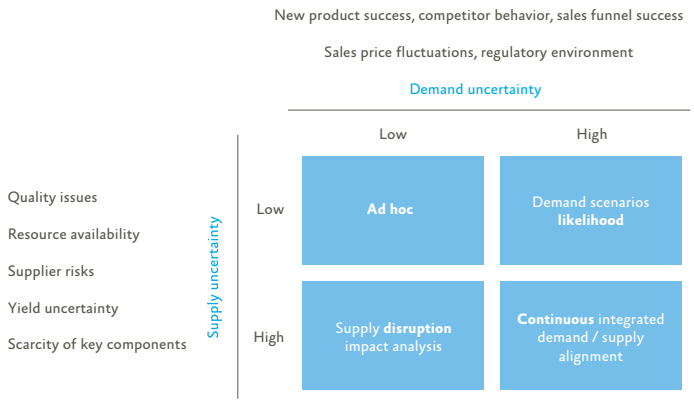


Figure 19: Main risks on the supply and demand side.

The substantial majority (71%) of top managers recognize that risk will further increase in coming years. In stark contrast, only a small minority (18%) of companies has a fully mature risk-management process in place. Findings show that formal risk-assessment processes are often non-existent. Depending on the demand and supply risks a company is facing, this might represent an enormous challenge and be an area of major concern.

Continuous integrated demand and supply alignment, supported by dedicated scenario planning, is an effective way to evaluate these risks in a structured way and determine mitigating actions.

12 INVENTORY OPTIMIZATION

BUILDING BLOCK 8 – OPTIMIZE INVENTORY: DIFFERENTIATE ON PRODUCT CHARACTERISTICS AND SERVICE-LEVEL REQUIREMENTS

Inventory management remains under the spotlight, even after the fierce and rigorous inventory reductions that ensued as a result of the last economic downturn. The pressure on margins and the strong focus on working capital are the reasons for this. Inventory has always been the result of strategic decisions, risk evaluation and forecasting (in)accuracy.

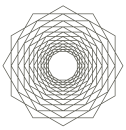
Research (Aertsen et al., 2010) on the relationship between forecast accuracy, inventory and service levels has been carried out in several industries. Results show that forecast leaders perform better and are therefore not only differentiating themselves on service levels. At the same time they hold significantly lower inventories (see figure 20).

	Laggards (accuracy < 65%)	Followers (accuracy 65-80%)	Leaders (accuracy > 80%)
Supply chain KPI's			
· Customer service	92%	94%	95%
· Stock (in weeks)	7.4	5.6	4.1

Figure 20: Forecast accuracy and the impact on service level and inventory.

The challenge is to reduce inventory in a sustainable way without jeopardizing service levels. Also in this case, a differentiated approach based on product demand dynamics and service level requirements adds value. Monitoring to ensure a healthy and balanced inventory should be an integral part of S&OP. Since market environments tend to become increasingly dynamic, inventory management will obviously remain high on the agenda in the future.

13
AN EFFECTIVE NPI & EOL PROCESS



BUILDING BLOCK 9 – ANTICIPATE PRODUCT PORTFOLIO CHANGES WITH AN EFFECTIVE NPI & EOL PROCESS

In the May – June issue of the Harvard Business Review of 1994, Marshall Fisher states: "Thanks to global competition, faster product development, and increasingly flexible manufacturing systems, an unprecedented number and variety of products are competing in markets ranging from apparel and toys to power tools and computers" (Fisher, 1994). The constant change in society applies at all times. Mobile phone manufacturers introduced 900 more varieties of handsets in 2009 than they did in 2000. Proliferation also affects mature product categories: the number of variants in baked goods, beverages, cereal, and confectionary, for instance, all rose more than 25% per year between 2004 and 2006, and the number of SKUs at some large North American grocers exceeded 100,000 in 2009.

Growth is one of the most undeniable company goals. For most the introduction of new products is a primary engine for growth. With the ever increasing pace in which new products are introduced, forecasting of these introductions is a major challenge.

New products can be differentiated in (1) products that are completely new to the world and the company (innovations), (2) replacement products and (3) special offers for specific customers /and or regions. For all categories different tactics apply.

	Characteristics	Business plan Q	Launch quantity
New	New to the company New technology ...	Bottom up / top down	Human enrichment Fast follow up via Point of sales, too much / too little
Replacement	Extension of product range with successor / predecessor relation	Top Down driven by business group.	Auto pilot / statistics Quantities distributed to Sales organizations
Specials	Upon request of specific country / customer	Bottom up	Make to order. Plan – commit = delivery

Figure 21: New products differentiated.

A main challenge is the forecast around the transition moment where the forecast of the demand for the successor has to be aligned with the demand for the predecessor. Since the number of introductions is often large and portfolio management is a key value driver, forecasting and planning is often integrated in the normal sales and operations planning processes. If this process is not managed correctly the launch window can be missed hence lost sales or stock can become obsolete.

Earlier research has revealed that forecasting sales volumes and values in the different stages of the product life cycle is perceived to be the most compelling challenge (Aertsen and Versteijnen, 2005). In practice as well as in theory, a great deal of attention has been paid to the shape of product life cycles (PLC), but the PLC concept as such has limited practical use. What are the forecasting techniques that provide the best possible insight into future demand for new products?

A large part of the literature on forecasting and planning product life cycles focuses on the use of sophisticated statistical forecasting techniques for mature products (McBruney et al., 2002). However, research suggests that the practical use of statistical techniques for new product forecasting is relatively limited (Aertsen, 2007). A main reason is that traditional time series and correlation forecasting methods require a significant amount of demand history, and thus these existing forecasting methods may not be appropriate for new product forecasting. Alternative statistical techniques like diffusion or so-called S-curve models are practiced but scarcely used.

Because of lacking or maleficent historical data many companies rely on the use of human knowledge to forecast the launch quantities for the new products. Using human created forecasts is not undisputed. The use of judgment introduces individual and functional biases in the forecast process that potentially decreases the quality of the forecast. This really holds in the area of new product forecasting where the vast majority of the input for the forecasts is provided by the inventor of the new product; the Product Manager (Olivia et al., 2009). The uncertainty associated with forecasting new product sales leads very often to mood swinging, i.e., feelings of optimism and pessimism, by forecasters. There are strong forces that will lead to a biased outcome of the process.

Companies have accepted advance purchase orders over the last decades. As a result, pre-order information may serve as a key input in developing a sales forecast for a new product.

Increasingly, consumers post their opinions on social media like Twitter and Facebook commenting on their experiences with products and services (Dijkman et al., 2014). Evidence on the use of social media to predict movie sales and book sales is already building up. However, no direct evidence on the use of Facebook data to forecast sales for new products exists. Forecasting techniques to be explored include predictive analytics using Facebook data and sales data from one of the winner's suppliers delivering directly to consumers.

14 FIT FOR USE TOOLS
15 THE RIGHT PLANNING SKILLS

BUILDING BLOCK 10 – SUPPORT PLANNING PROCESSES WITH IT TOOLS THAT SUIT BUSINESS DYNAMICS AND COMPLEXITY

The majority of companies still use Excel-based planning applications to support their S&OP process. In some instances, a low supply chain complexity doesn't require advanced planning tools, but their use in other cases offers many benefits, one of which is mathematical models to optimize supply plans and assess planning scenarios in case of demand or supply uncertainties. Advanced planning tools also allow companies to integrate various demand and supply plans across the supply chain, increasing transparency and resulting in significant cost reductions.

Although decision-supportive tools and advanced planning tools are high on the agendas of supply chain professionals, these tools must have added value to support S&OP and demand-planning processes. In a highly complex, global supply chain and especially in an industry where the financial component is crucial, advanced planning tools add value to decision-making efficiency. But in any model, the quality and efficiency of the planning process is more important than the tools used.

Today, a wide variety of planning tools is offered to support forecasting & planning processes. The planning & forecasting wheel (see figure 22) provides an overview of forecasting and planning tools. It is not exhaustive, but the tools in the outer circle currently represent, or will soon represent the future main Forecasting and Planning tool offering.

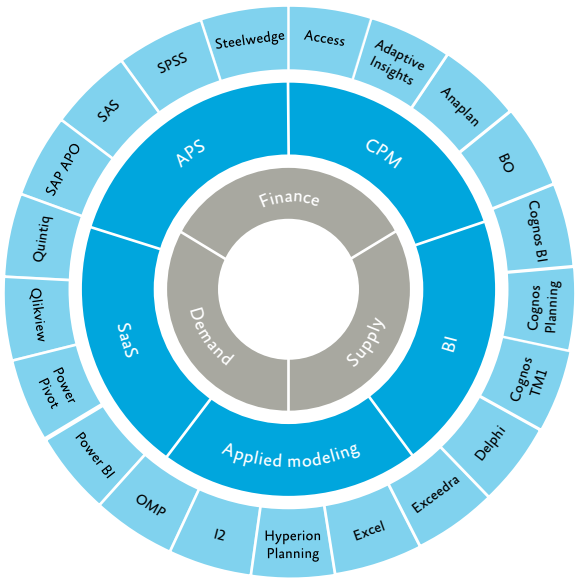


Figure 22: Forecasting & planning tools (2015).

15 THE RIGHT PLANNING SKILLS

BUILDING BLOCK 11 – PLANNERS' SKILLS ARE KEY TO IMPROVING PLANNING ACCURACY

In the past decade, the skills required from planners have changed significantly, as a consequence of increased complexity, dynamics and uncertainties in the planning process

Based on an extensive EyeOn benchmark (Aertsen et al, 2010), the relevant skills of planners were identified that contribute most to improving plan accuracy (see figure 23).

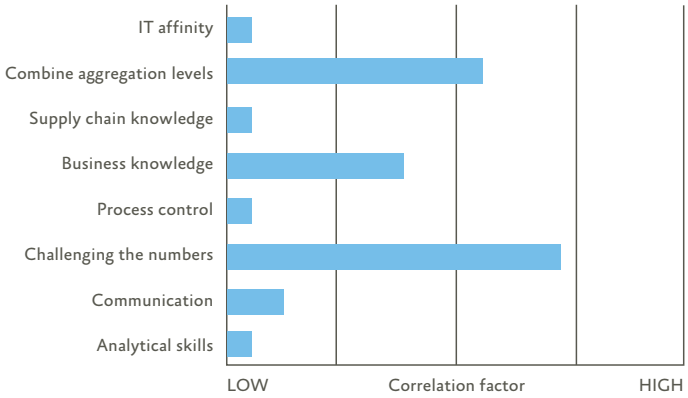


Figure 23: The importance of planning skills.

Skilled planners are generally graduates of higher education with at least a bachelor's degree. Planning calls for an analytical mind and solid grounding in mathematics and statistical skills. But more important, a good planner must also be able to communicate well across all levels and silos of an organization and dare to challenge the inputs they get from other people. A deep business understanding of the requirements and specific interests of manufacturing, logistics, marketing, sales and finance. They are also able to reach outside a company's walls to suppliers and customers, to ensure that all parties are in agreement about what the plan should be. So, planners need to have strong leadership qualities, the ability to influence people and to lead by collaboration.

16 CONTINUOUS IMPROVEMENT
17 UNDERSTANDING HUMANS

16 CONTINUOUS IMPROVEMENT

BUILDING BLOCK 12 – CONTINUOUS IMPROVEMENT HAS THE STRONGEST RELATION WITH FORECAST ACCURACY

The essence of continuous improvement lies in active reflection on the effectiveness of actions taken in the past and identifying improvements for future improvement.

The improvement process is essentially about learning rather than blaming. True learning occurs when the real root causes of issues are identified, understood and managed in a step-by-step improvement process. Although this seems to be a relatively straightforward matter, achieving it often proves to be quite a different experience, as shown in the figure below.

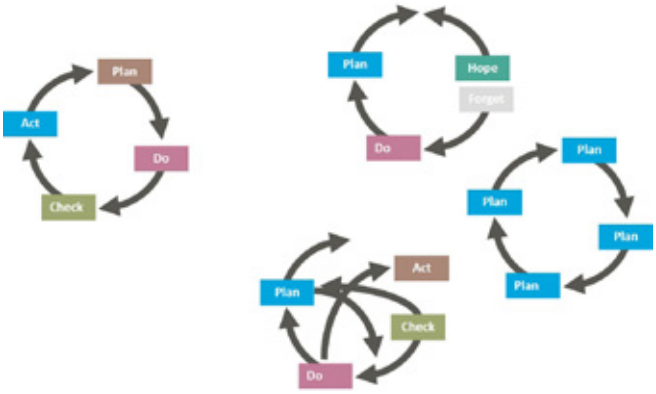


Figure 24: Three 'wrong' Deming circles.

Dr. J. Edward Deming, the famous quality guru, provided a simple yet highly effective technique that serves as a practical tool to carry out continuous improvement in the workplace. This technique - PDCA (Plan, Do, Check and Action) Cycle or simply Deming Cycle - provides a conceptual as well as a practical framework for continuous improvement.

Research by EyeOn (Aertsen et al., 2010) revealed that a well-structured continuous improvement process makes the strongest contribution to forecast accuracy improvement.

The application of the PDCA cycle helps an organization to become agile or incorporate closed-loop management with speed. The process helps integrate the functioning of demand management, supply management, fulfillment management, rapid business reconfiguration, and IT systems within an organization.

17 UNSTANDING HUMANS

BUILDING BLOCK 13 – UNDERSTAND HUMANS

Business forecasting in most companies is a complicated process, involving numerous systems, managers and executives. In the process, a huge amount of data is processed using sophisticated algorithms and software and integrated with many sources of human judgment. Due to the enrichment process the quality of the forecasts is influenced by the impact of politics and personal agendas in each separate process step. Studies have shown that people inject significant bias into the process during preparation and interpretation of the forecast (Inforte, 2002). For example, a forecaster could be optimistic about future sales and adjust the forecasts accordingly, but at the same time ignore other perceptions of market trends. When forecasters have motivations for a particular outcome, inclusion of their judgmental forecasts is likely to add bias to the forecast. This behavior can lead undesired outcomes (Fildes, 2009).

Bias inflicted in the forecasting process

A variety of tactics, manipulations, and adjustments exist that can lead to adding bias to forecasts. Some of these are obvious and easily recognizable, while others are subtle and are hidden in the process. In general, all of these different factors influencing the quality of the forecasts can be characterized as intentional or unintentional attempts to influence or distort the forecast output. Unintentional bias error, for example, could result from lack of knowledge about market developments or lack of knowledge on statistical tools. Revising forecasts to reflect sales or revenues to a more favorable level, on the other hand, is a form of creating intentional bias. The recognition of this bias is important for the development and implementation of effective and efficient processes.

There is a vast body of research showing that when provided with a good prediction an individual will generally adjust the forecast and reduce its accuracy (Lawrence et. al, 2006). As human beings we are not enriching the forecast; on the contrary, we tend to 'impoverish' the initial forecast.

17
UNDERSTANDING HUMANS

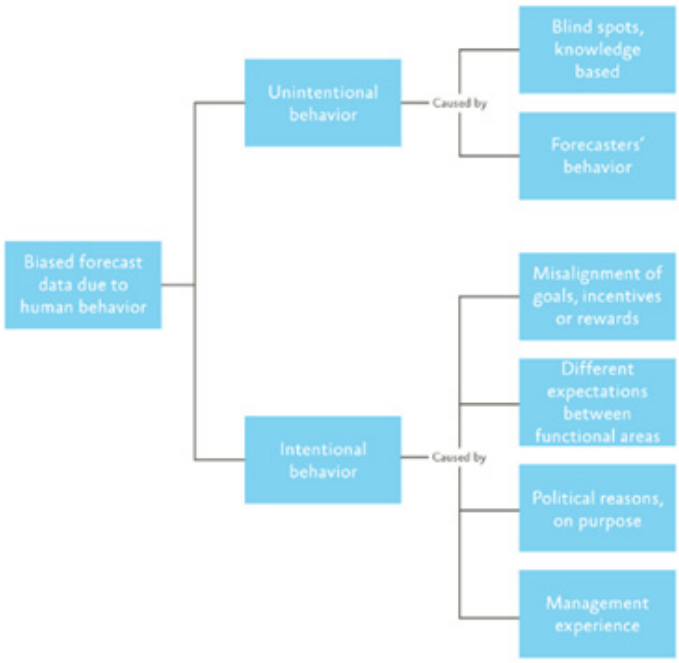


Figure 25: Different forms of bias in forecasting.

Unintentional behavior is related to routines and culture that affect the outcome of the forecasting process in ways of which managers might not be aware (Oliva, 2006). This creates potential sources of bias that are unconscious, but systematic, and are a result of what can be called blind spots. These are sources of error caused by ignorance of specific areas that can influence an individual's or group's forecast. Blind spots can be either informational, related to the information on which a functional area bases is forecast, or procedural, related to the algorithms and forecasting techniques used to generate forecasts.

The starting point for making forecasts lies in gathering (raw) data. Nowadays, computerized systems make it possible to generate an unheard amount of data. Most of these data are, however, only an estimate of what has actually happened. The most common example is guessing what consumers bought based on what the company itself sold, instead of considering the demand known at the furthest downstream point. Data that are gathered further away from the point of sale will be less accurate in most cases. The quality of data used as input for the forecasting procedure is often not available and more important, is not known and therefore forms a blind spot for creating bias (Zhao and Xie, 2002).

The application of appropriate quantitative forecasting techniques can also be influenced by the procedural bias. According to a longitudinal study on the evolution of sales forecasting techniques over a 20-year time horizon, conducted by McCarthy (2006), forecasting practices have significantly reduced in terms of familiarity, satisfaction, usage and accuracy. This especially holds in terms of training for familiarizing the methods and appropriate areas of usage (Klassen and Flores, 2001). As a result, wrong models, techniques and assumptions can be used unintentionally for making forecasts. Using a third party forecast service provider with strong analytical skills potentially reduces these blind spots or procedural bias.

In addition to informational and procedural blind spots as a source for bias, the forecasters' individual behavior also comes into play. To some extent, the way in which forecasts are established is influenced subjectively and depends on the person responsible for making the forecasts. Consider a situation in which two forecasters have to make a forecast based on exactly the same initial data. Ideally, this should lead to exactly the same forecast. However, this is not always the case. People selectively use information and have their 'own perception of the world'. This might lead to structural over or underestimating of forecasts due to, for example, overconfidence, anchoring, wishful thinking or optimism. The forecasters' behavior cannot be overlooked, which is influenced by a set of four factors: cognition, emotions, power and the company's values and norms (Organization and Behavior, 2000).

People tend to process, interpret and judge information in a selective manner, based on their own knowledge and perception of reality (cognition). Unintentionally, this could in some cases influence forecasting. Especially when it takes human judgment to integrate changing market trends, special events or introduction of new products into the forecasts. Also emotions play a role in determining human behavior. People could be afraid to make mistakes, or prefer others to come up with new ideas and thoughts.

Values and norms of the business environment could influence human behavior in such a way that bias is created. Organizations with a low perception of job security, for example, are associated with highly-manipulative environments. This also holds for organizations where the fear of detection is low (Galbraith et al., 1996). This closely relates to the power that the forecaster has in influencing forecasts and the power he perceives from other actors in the organization. Commodities of power are, for example, access to important information, formal (role-based) authority, and external reputation.

Intentional behavior results from motives, opportunities and means. Given sufficient motive, sufficient opportunity, and the means by which to influence the dynamics of forecasting and modeling, distortion and deception are likely outcomes (Galbraith and Merrill, 1996). Intentional biased errors, also called motivational biased errors, result from the use of politically adjusted or misleading data. A manager may request staff to adjust revenue projections

to a more favorable level, or predetermine an 'appropriate' future financial position, then request staff to generate pro-forma to support the decision. Four potential reasons to change the forecast can be identified:

1. Misalignment of goals, incentives and rewards
2. Different expectations between functional areas
3. Deliberate political reason
4. Management experience

Misalignment of goals, incentives and reward

Prevention of structural over and underestimation in forecasting (sandbagging vs. conservatism) is often related to the target setting and reward structure. Many companies reward by a combination of a straight salary and bonuses. By including both a fixed monthly wage and a sales percentage, management seeks to secure company control and to motivate staff. However, this way of remuneration can be damaging to the attention paid to the forecast. An alternative is that part of the bonus depends on the achievement of a sales budget agreed upon. This strongly encourages gaming the system. First, a manager may manipulate the setting of the budget by withholding information about what he or his unit could really achieve, thus distorting the informational flow. Then he can start playing games by increasing this year's earnings at the cost of next year's, or the other way around when the budget for this year is out of reach. All of these are well-known and non-desired actions (Jensen, 2002).

Different expectations between functional areas

A variety of demand and supply plans exist that are used by different functional areas, think for example of financial, manufacturing, sales or inventory plans. Ideally, these plans are in line with each other, but in practice this is not always the case. It is because the responsive planning process can be hindered by its time- intensive nature and potentially conflicting functional agendas. In reaching one single forecast, which has to be used by everyone, the consensus process may be biased by functional areas that are seeking to influence the outcome. Optimism is strongly available in the marketing and sales forecast (Fildes, 2009) while the production input is known to be rather conservative. The natural division of labor in functional areas generates specific orientations and competences with respect to objectives, planning horizons, and methods to communicate with stakeholders. However, seen in the light of the organization this may cause sub-optimization and at the same time generate inaccurate forecasts. Operational forecasts may be biased by inventory considerations and utilization policies, finance forecasts by market expectations and profit or loss expectations, and executive forecasts by goal setting pressures. For example, with inventory shortages as its primary responsibility, the operations group would frequently generate its own forecasts to minimize the perceived exposure to inventory discrepancies, and marketing would do likewise when it anticipates that promotions might result in deviations from sales forecasts (Oliva, 2006). To overcome these sorts of biases, the different points of functional views should be compared and eventually lead to one single consensus forecast serving as a guide for the entire organization.

Deliberate political reason

Political motives may call for inflating forecast numbers for internal or external organizational purposes. The perception of the environment about a company, i.e., the external reputation', is of high importance. All the elaborate business plans, innovative ideas and strategic moves are meaningless if you do not have a good reputation in the eyes of your customers, employees and potential investors. A solid reputation is what gives people the confidence to do business with you—and helps your company through the tough times. Forecasts may provide an easy opportunity to influence this reputation. High forecasting could, for example, better position the company and influence stock prices to gain favorable positions with stakeholders, lenders, and investors, or to get support for new product introductions and capacity expansions. In times when that the business is not as profitable as expected, forecasts could be kept low, to justify expenditures or losses. These intentional gaming exercises should be eliminated from the forecasting procedure in order not to distort the forecasting figures.

Management experience

In general, budgets are made annually and serve as a guide for the new financial year. As time evolves, the quality of the budget compared to the actual numbers gets known. If the actual sales numbers are close to what was budgeted, the company has successfully managed its forecasting process. However, if a gap exists between reality and the budget, this might not have been the case. This is either caused by inappropriate forecasting techniques (both quantitative and qualitative) or by unexpected and fast-changing market circumstance, which is not unusual in, for example, the High Tech and electronics industry. An easy way to close this gap and keep matching the original budget is by adjusting or changing the forecasts and thereby creating bias in the forecasts. This may be considered to be a quick solution to be able to stick to the original budget but is, however, only a temporary win and focuses on the short term instead of the long term.

In summary it can be stated that it is important to monitor the added value of judgmental adjustments and only use human knowledge where really required. The FVA (Forecast Value Added) measurement, indicating the value add of the stages of changing forecast data.

18
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ABOUT EYEON

In striving for success, large companies have to continuously struggle against growing internal complexity. We help our clients manage this complexity by designing, implementing and executing excellent planning processes as a discriminating factor for this success. In order to achieve this, we develop and share knowledge about top level planning and forecasting, with constantly demonstrable return on investment for our clients.

KNOWLEDGE NETWORK

In 2005, EyeOn launched a knowledge network through which High Tech companies share business planning experiences and best practices. Many of our network members also participate in benchmarking and in the meantime, multiple network meetings and conferences have been organized on various business planning topics. These have proved highly successful.

Beyond network events and benchmarking, EyeOn also organizes expert sessions and master classes in various specific domains of supply chain and financial planning.

For more information: www.eyeon.nl.

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