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Demand and Supply Stability in the Pharmaceutical Industry
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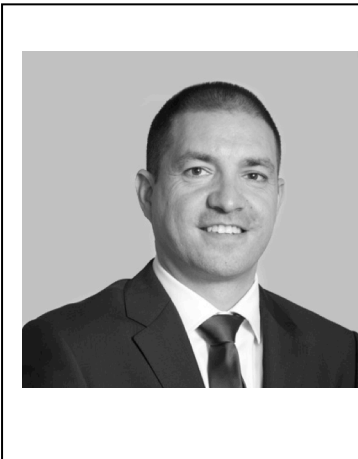Zaragoza, SPAIN
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Demand and Supply Stability in the Pharmaceutical Industry

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Summary:
A pharmaceutical company is facing instability in the planning process. Using analysis of real data, Root Cause Analysis, and interviews in the field, the thesis aims to investigate the main causes that are leading to this situation and propose solutions for improvements that could help the company to achieve appropriate stability levels.
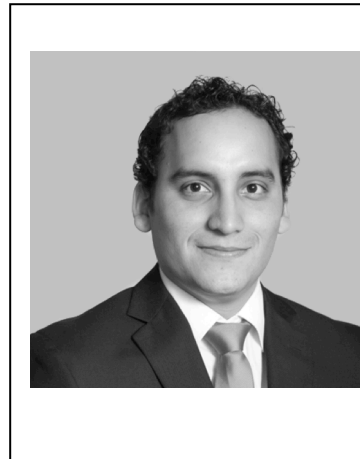
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KEY INSIGHTS

1. *KPI Design*: Five KPI limitations, which affect the final stability performance, are caused by the design of the KPI, not by the performance of the process.

2. *Demand and Supply Plan Stability Relationship:* Based on the data evaluated, there is no strong relationship as expected between the demand plan stability and the supply plan stability performance.

3. *Root Cause Analysis*: Using the root cause and sensitivity analysis, we achieve improvements and countermeasures, which can be implemented by the company and by other industries.

Introduction

The reliability of the supply chain is especially important in the pharmaceutical industry compared with other industries, since a stockout of the product can reduce the effectiveness of the treatment on the patients, putting their lives at risk.

Our sponsor company, one of the largest research-focused healthcare companies in the world, has been working on developing a reliable supply chain in all the 150 countries in which it operates.

Having stability in demand and supply planning helps to achieve the reliability goal. It also makes the production stable and reduces the total cost. The processes of demand and supply planning are closely interconnected, and an agent's behaviour (demand) is directly linked to the behaviour and options in another (supply).

How can companies manage demand? They need to know their sector very well, and the most important tool is to create a forecast that enables them to know the future with some guarantees. Demand planning is an operational supply chain management process used by companies to create reliable forecasts and orders in accordance. It helps companies to improve the accuracy of revenue forecasts, align inventory levels with peaks and troughs in demand, and enhance profitability for a given channel or product.

How can companies manage supply? The outcomes of Demand planning are used by Supply planning, so it is important to make this information accurate and stable. Supply planning is a component of supply chain management that aids in predicting future requirements to balance supply and demand. The main outcome of the supply planning is the Supply Plan, which is used by the production plan in order to plan and manufacture goods or products.

Therefore, if a company has demand stability or is able to accurately forecast demand, it can also expect to have supply plan stability and production plan stability (i.e., if there is an accurate forecast the production plan can follow it, avoiding dramatic changes in the plant). However, the reality is far from this ideal.

Even though the sponsor company has achieved high forecast accuracy, its demand, supply and production plans were instable. Therefore, the company aims at creating a simple planning operating model and developing some planning stability KPIs in order to measure and improve the current situation.

Current process and problem definition

The supply process is divided into three steps:

1. In the first step, the branch in each country makes its own forecast the next 36 months of every product, and sends this information to the Demand Planner. This demand forecast is known within the company as Independent Demand.

Then, the Demand Planner starts to plan the needs of the company's production. The plan takes into account not only the forecast but also the current inventory stock and some other constraints (such as safety stock) within the company. The outcome of this step is the Demand Plan or Replenishment Plan, and it is the starting point for the Supply Planner.

2. Based on the capacity of the plants, inventory policy, on-hand stock, and other feasible constraints, the Supply Planner is responsible for translating the replenishment plan into orders to the Master Production Scheduler (MPS), taking into account the lead times and solving the possible gaps in order to develop a feasible

plan. If necessary, reconciliation between the demand and supply will be done, taking into account the supply capacity, the projection of sales, and the demand needed.

3. The last step is the production of finished goods, where the MPS is responsible for planning the detailed schedule of production at the plant and also checking the feasibility of the plan that the Supplier Planner has designed. Finally, the plan at start of production is determined and recorded in the system.

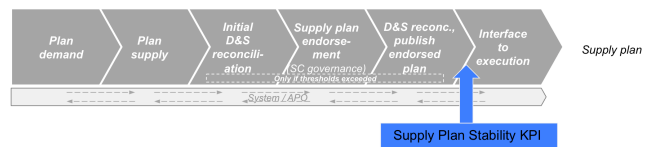The following figure represents graphically the process explained above.

Figure 1. Current Planning Process and SPS Snapshot

To measure the stability of the supply and demand planning process, two KPIs were developed:

- Demand Plan Stability (DPS)
- Supply Plan Stability (SPS)

The figure below shows the results that the company obtained after the implementation of the KPIs.
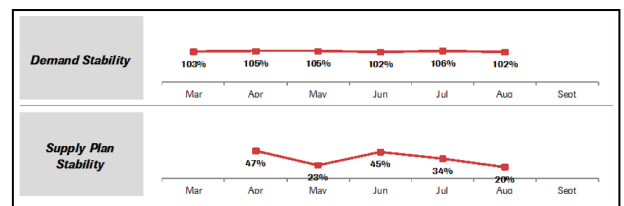

Figure 2. Demand & Supply Stability KPIs Performance

As we can see, the behaviours of both KPIs are totally different. There is great instability on the Supply KPI, although the Demand KPI is quite stable. The company did some initial work in order to find the outliers or issues. However, it was not clear whether there was a problem in the production process or there was a bad formulation of the KPI that created the instability of SPS. It is the aim of this thesis to address these issues.

Outcomes

The thesis contributed five main outcomes:

- **Identify limitations of the KPIs:**
  Our research analysed the performance variation introduced in the KPI by its specific design and determined the KPI limitations.

- **Adjust the KPIs:**
  Determine if the actual KPIs, especially the supply KPI, is really useful and whether it reflects the real process (i.e., whether the design of the KPI gets the real picture of the process and the goal of the KPI). Adjust the timing of the snapshots of the supply KPI so it can really measure the time when the plan has to be fixed.

- **Identify the interaction between Demand and Supply KPIs**:
  In order to determine the real impact of the changes of demand plan into the supply plan and the final production schedule, it is important to identify the relationship between Demand and Supply KPIs.

- **Develop and implement an efficient Root Cause Analysis process:**

  Design an efficient root cause process that can be used to improve the process. Identify all the stakeholders, process and causes that can affect the supply plan and the final performance of the KPI.

- **Define potential countermeasures to improve stability for Demand & Supply:**

  Develop countermeasures to reduce the variability of the Process and KPIs and a plan to implement them.

Conclusions

- There are three main classification causes that explain the current performance of the Supply Plan Stability KPI: KPI Design, Measurement System, and Process Operation. Each one of them has its internal causes that create the actual performance of the KPI.

- There are five KPI limitations caused by the design of the KPI, not by the performance of the process, and three KPI limitations created by the setup of the Measurement System. For each one of them, an improvement was created. These improvements should be implemented in order to build a KPI that is capable of detecting all the changes that affect the stability of the supply and demand plan, as well as measuring it properly with the impact on clients and the real behavior of the plans. It is important to mention that some of the improvements of the KPI design can create a decrease in its performance. However, it should still be implemented, since those improvements make the KPI more efficient in detecting the reality of the operation and making the KPI a stronger tool to improve the process.

- There is a lower direct impact of the Demand Plan Stability in the Supply Plan Stability: only 28% of the variation of the SPS is explained by the variation of the Demand Plan (based on the data analyzed), even though the Demand planning process is the main input of the supply planning process and execution. An analysis with all the SKUs of the company should be done as a future research project to determine if this is a behavior of all the products and supply and demand planning process of the company, or is just a particular case of selected SKUs.

- The comparison of the current SPS and DPS KPIs could lead to erroneous conclusions, because the main purpose of each one is different. DPS is focused on Planning but SPS KPI is focused on execution. In addition, they compare different time windows: DPS uses more than 12 months to calculate the KPI, which reduces the impact of each month, while the current SPS KPI only uses two months.

- Through the Root Cause and Data Analysis it is possible to determine the main causes that are leading to the instability in the plan and the entire supply process. The study can be extended to other industries that face the similar instability problem.