

**Uncertainty in the supply chain** is a topic all companies must deal with. Fluctuations in demand, supply bottlenecks, quality deviations, fluctuating resource performance or price fluctuations, to name just a few, represent permanent risks for the supply chain. In times of the Corona pandemic, additional uncertainties are added. Depending on the complexity of the supply chain, an adequate handling of uncertainty is key and

can determine the success or failure of a company. Based on Bronk & Company's experience in dealing with uncertainty in supply chain management and its particular importance in the current situation, we are dedicating a special issue of NEWS SUPPLY to this topic. We describe concepts how companies can deal best with uncertainties and even turn them into opportunities and finally into business success.

## Detect, evaluate and transform supply chain risks into opportunities

### **Risk analysis using simulation techniques**

Today more than ever, supply chains are complex-affairs comprising of a wide variety of risks with a significant impact on the success of a company.

Take a simple example: The delivery performance of a company does not only depend on its own manufacturing reliability (in terms of deadlines, quality, quantity), but also on other factors such as the reliability of input material suppliers or external service providers.

For example, the following risks greatly influence the supply chain and thus the company's performance:

#### **Demand fluctuation**

- » Quantities, prices and change requests from customers

#### **Fluctuating performance**

- » Resource performance and reliability

- » Quality, transportation and lead times

- » Reliability of subcontractors

#### **Raw material supply**

- » Time, quantity and quality

The actual risks and their interactions are even more complex: Individual risks act like a domino effect and thus amplify the risk to the company's performance.

### **Evaluating the expected performance of the company**

Supply chain planning is often executed in a deterministic fashion solely relying on the "most likely" case. This neglects how far the "risk amplitude" can swing, meaning that the risks are not sufficiently considered in the planning process.

Simulation techniques allow uncovering of supply chain risks and drawing conclusions about the cumulative risk

on the performance of the company (e.g. expressed in the KPI profit).

Only with the help of simulation techniques, the holistic evaluation of alternative plans becomes possible. Thus, decision makers are enabled to identify opportunities in the supply chain.

In addition, the B&C approach considers the individual or strategy-based risk attitude of the company or the decision maker.

**Use Case:** Planning with uncertain resource capacities in a supply chain with 4 resources

### **Deterministic planning vs. risk simulation**

The standard planning approach (deterministic planning) reduces the underlying uncertainty to a single value. Hence, the range of uncertainty is neglected, e.g. the plant capacities, as





shown in **Figure 1** for a supply chain with 4 resources.

In this case, the relevant KPI profit (alternatively other KPIs such as on-time delivery) is also reduced to a single value. Possible risks are withheld from the decision-makers and can lead to suboptimal decisions with negative cost implications.

In contrast, risk simulation uncovers the entire range of uncertainty. By simulating many possible combinations of uncertain values, the influence of uncertainty on profit becomes visible. The company obtains an almost

complete picture of the possible characteristics of the KPI (here profit), as shown in **Figure 2**.

### Better decision-making through risk simulation

Risk simulation provides the decision-maker valuable information about the probabilities of the possible realizations of the KPI of interest.

**Figure 3** shows the result of the risk simulation for the status quo (pink curve) as well as the impact of other risk mitigation strategies (see further description in the following section) in the form of a distribution function.

The cumulative distribution function indicates that a profit of 6616 (KPI value of deterministic planning as shown in Figure 1) is achieved only in 14% of the cases, while the expected profit (average profit obtained in the simulation) equals 5953 which is much lower. Additional insights are gained by the comparison of different risk mitigation strategies and their effect on the KPI distribution, which would remain hidden without a simulation-based analysis.

The holistic evaluation of measures is even possible with the inclusion of the companies' or of the decision makers'

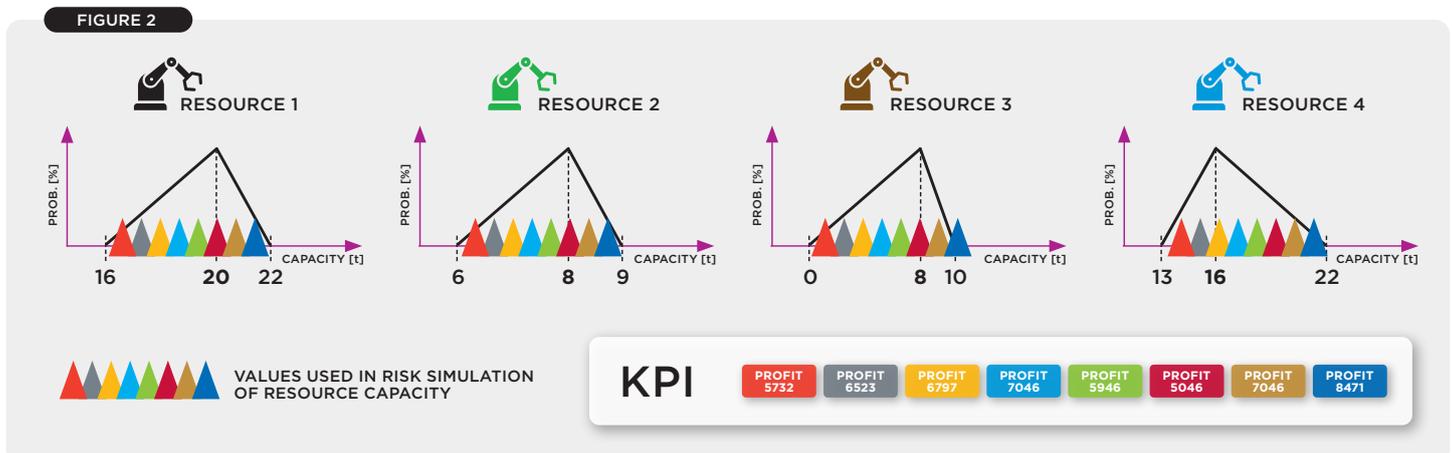
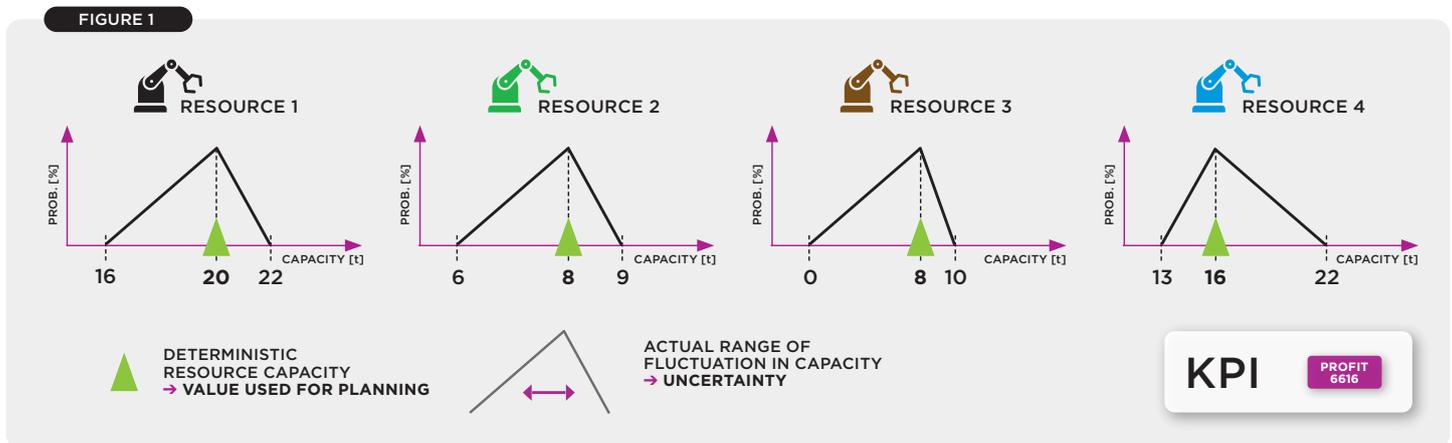
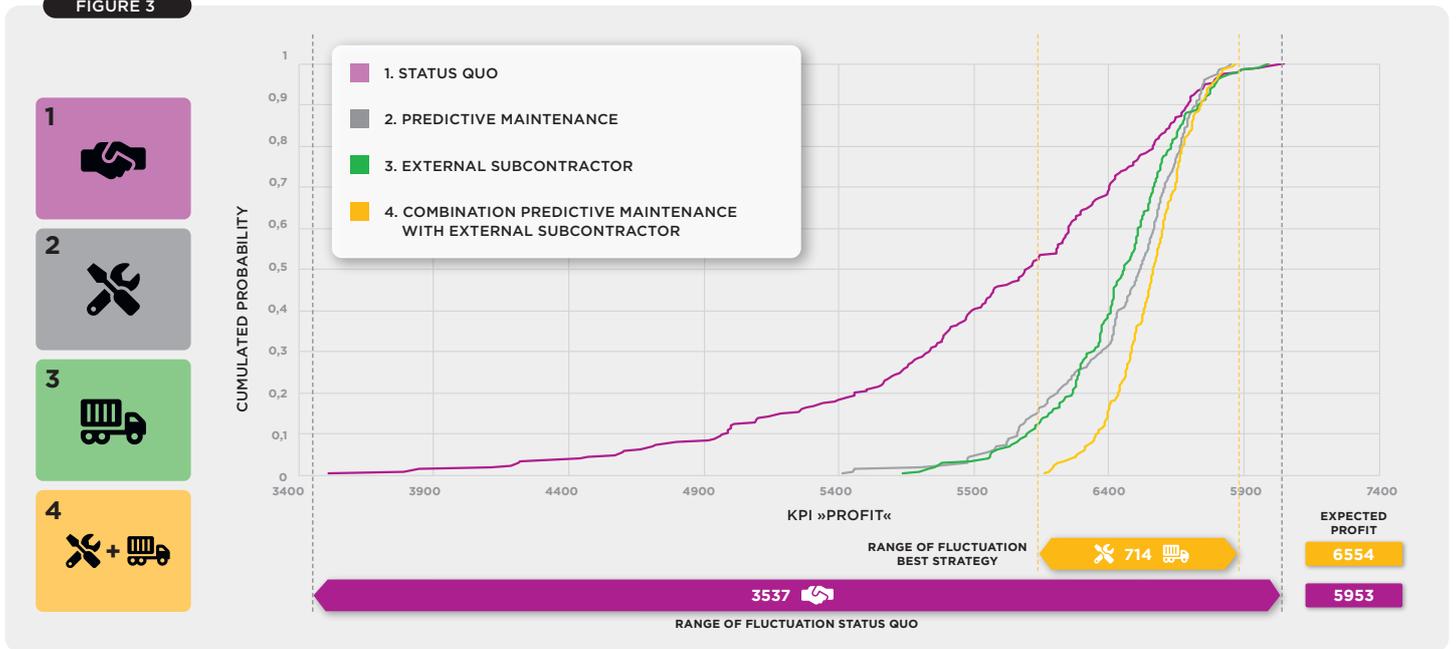


FIGURE 3



risk attitude. For example, the following strategies can be evaluated:

1. Status quo (pink curve)
2. Introduce predictive maintenance (gray curve)
3. Use subcontractor (green curve)
4. Combine predictive maintenance with subcontractor (orange curve)

The effect of the respective risk mitigation strategies on the profit distribution is also shown in Figure 3. For all measures, the range of the KPI profit is smaller (in some cases by a multiple) and thus the result is much more stable than in the status quo.

Based on the additional insights, it is possible to make an educated decision about the best strategy. Here, the best

strategy for almost all risk attitudes is clearly the combination of predictive maintenance with a subcontractor, which leads to an expected profit of 6554 (vs. 5953 in the status quo) with a significantly lower variance.

A deterministic planning approach would not have shown any need for action since the underlying chances and risks cannot be evaluated.

Risk mitigation strategies are usually associated with additional costs. The resulting additional benefit or the “hidden” business case is only revealed by the systematic analysis of the risk.

### Conclusion

Since uncertainties are present in real-world decision making, deterministic

planning approaches provide a biased decision-making basis. This could lead to costly suboptimal decisions.

Risk simulation considerably improves planning and decision quality. Possible areas of application are very versatile: Our approach allows to optimize strategic topics, such as site location planning or strategic capacity planning.

Also, operational questions, such as the evaluation of the order book (regarding on-time delivery, additional costs for overtime, windfall, etc.), can be answered.

To implement the concept in practice, we offer a dedicated consulting approach (see the following page).

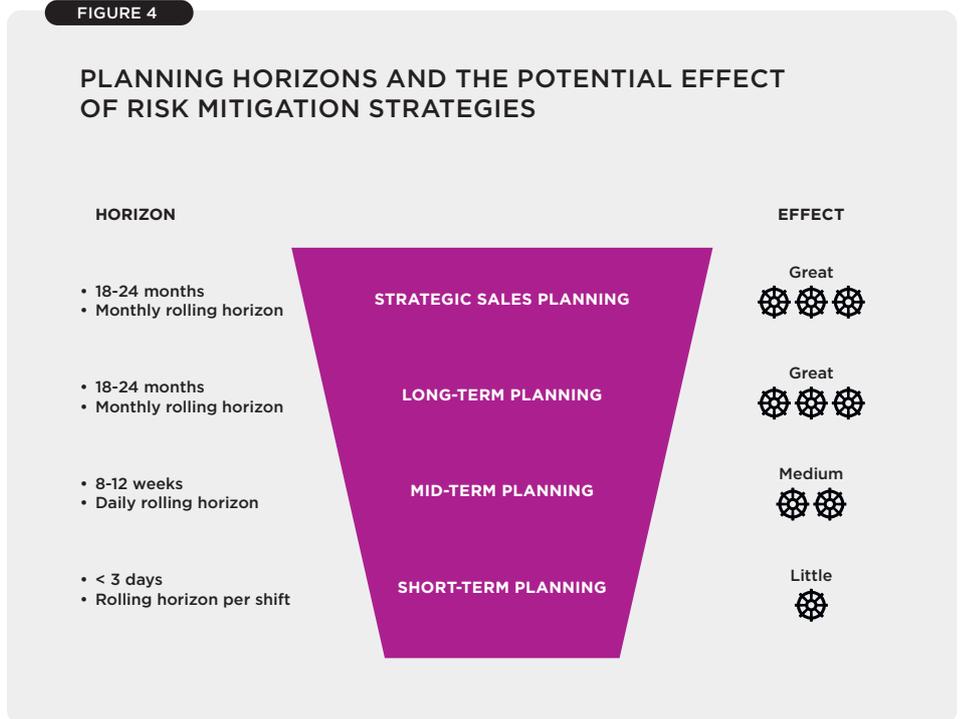


# Our consulting approach

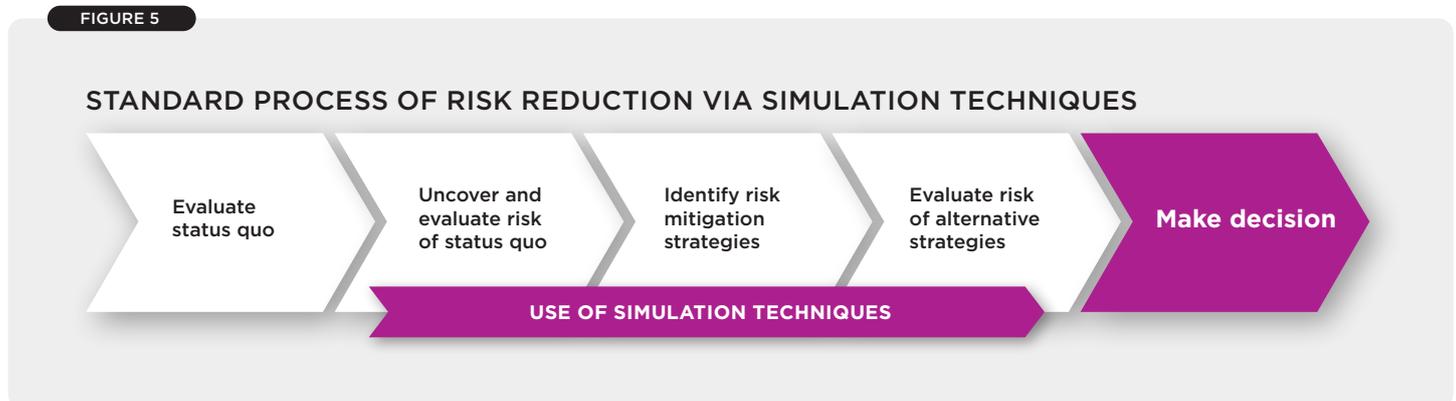
During our consulting projects, we repeatedly encounter uncertainties in the supply chain, which are neglected in the planning processes at all levels. The more strategically uncertainty is “thought through in advance” and mitigated with adequate measures, the greater the positive effect will be on the company’s performance (**Figure 4**).

We recommend that uncertainties are at least considered in the annual budget planning process and that appropriate mitigation strategies are taken. A simple “best-case & worst-case” scenario analysis is often insufficient to support adequate hedging of uncertainty.

We therefore work with our customers to develop and implement a standard process for systematic evaluation and decision-making that is integrated into the relevant planning processes (e.g., the budget planning process). The key is to make risks transparent, understand their impact and to define and execute adequate risk mitigation strategies (**Figure 5**).



We would be pleased if we could also support you in managing uncertainties in your supply chain to optimize your supply chain performance.

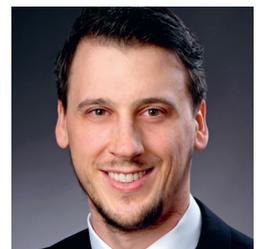


For further insights, practical examples or opportunities to use risk simulation, please contact us at [info@bronk-company.com](mailto:info@bronk-company.com)

Your contact persons:



Dr. Pascal Lutter  
Manager



Christian Germeroth  
Partner