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WHITE PAPER

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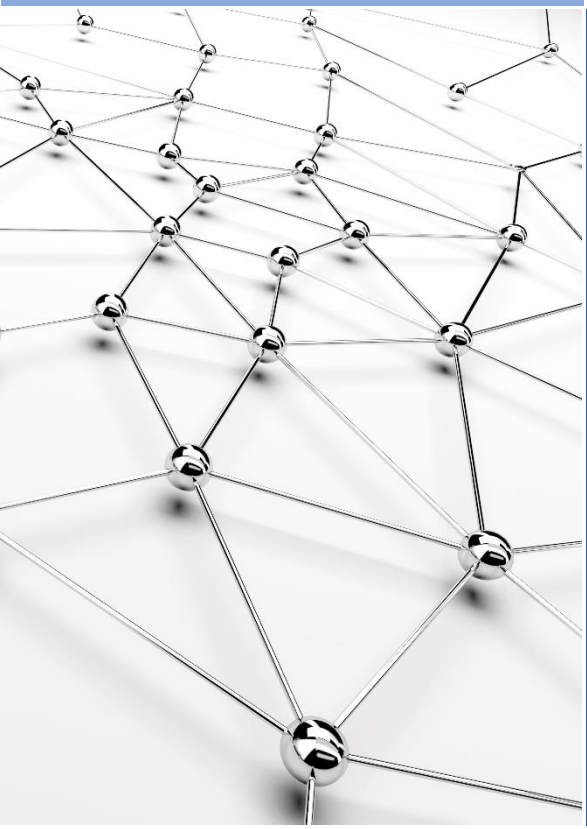

Efficiency Analysis and Improvement of Supply Chain Processes by Constraint Analysis

Inhalt

ANALYZE - SIMULATE - AUTOMATE A QUANTUM LEAP AHEAD	**Abels & Kemmner** brings the optimisation potential of supply chains to light and replaces gut feeling with facts.
Thanks to our **unique consulting approach**, we help companies to achieve sustainable concepts, which we validate and optimise and implement in a secure and agile manner.	**As a pioneer in** logistics simulation and automation in supply chain management, we combine strategic and operational consulting with powerful digital methods.

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Efficiency analysis and improvement of supply chain processes by means of constraint analysis

Chain up core causes and strengthen the organisation sustainably

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The results of your supply chain processes are insufficient, you have implemented a whole range of measures, but success did not come as expected. You probably did not work on the core causes, because these are often difficult to find.

Supply chains represent a network of machines, materials, logistics, processes, methods, customers, suppliers, employees and business rules, whose interaction is often intransparent and always complex, and whose results often do not meet expectations or requirements. But how can efficiency be increased, how can crucial weak points be identified?

This is precisely where the constraint analysis of supply chain processes comes into play, with which Abels & Kemmner has had the best experience for many years. The constraint analysis uncovers the core causes of inadequate results or alleged weaknesses, if necessary from the supplier through your organisation to the customer.

Constraint analysis is an element of the Theory of Constraints (TOC) developed by the American-Israeli physicist Eliyahu Goldratt (1947 - 2011).

TOC is based on the realisation that every organisational-technical system continues to grow until a system element comes up against a limitation (= bottleneck). If this bottleneck is recognised and removed, the system continues to grow until another system element comes up against a bottleneck. The bottlenecks can be of a technical or organisational structure, but they can also often consist of internal regulations, principles or company policy. The constraint analysis is a systematic method for identifying the bottlenecks mentioned.

With simple contexts, bottlenecks are easy to identify:

It makes little sense to widen a motorway from three to four lanes if there is a single-lane bottleneck in front of it. With the many dependencies and restrictions in supply chain management and operations, the relevant bottlenecks can hardly be identified.

The result of the constraint analysis is a so-called reality tree, which, like a circuit diagram, shows the cause-effect network between recognised symptoms and the underlying root causes. They represent the bottlenecks in the technical-organisational system that slow down the performance of the overall system. These root causes must be eliminated in order to eliminate the observed weaknesses and increase the efficiency of the overall system, as if in a series of falling dominoes.

Identify core causes - define measures - solve the problem

By dissolving the cause-effect network, many individual problems that would have been tackled in separate sub-projects and work steps in a conventional process analysis virtually resolve themselves. This shows the effectiveness of the constraint methodology.

Complex problem contexts, such as the decisive starting points for improving the logistics business model, optimising business processes and increasing profitability, can be uncovered, efficiently and sustainably attacked and subsequently eliminated with the help of constraint analysis.

The core problem - starting point and hook of the analysis

The starting point of the constraint analysis is always a significant and subjectively perceived, or better still, objectively measured problem, e.g.:

- The delivery readiness versus customer is too low, it is 82% with 95% target delivery readiness.
- The stock turnover rates are too low with values < 1 and the stock ranges are too high with 35% of the stock value in articles with ranges > 1 year.
- The lead times of in-house production are 50% higher than required.
- The quality of the manufactured articles has declined, reject rates and costs are rising, and the ability to plan is declining.
- The suppliers' readiness to deliver is too low, additional security mechanisms, such as security times, increase the costs in the company.
- Bottleneck and missing part situations in production become a permanent topic, missing parts lists and daily shop floor meetings for prioritising production orders become the leading control instrument, exacerbate the unrest in production and thus the problem itself.
- and much more.

At the beginning is the technical-organisational process

A constraint analysis of supply chain processes starts with capturing the value stream of the company or the processes of all relevant company divisions. This step creates transparency and is often an essential tool not only for external but also for internal project staff to be able to understand the overall context.

Then, partial fragments of the cause-effect network are identified in workshops and interviews with the departments involved. The interviews make it possible to examine certain causes and their effects from different departmental perspectives. If necessary, correlations can be proven or disproven through analyses and simulations, or their impact can be investigated.

From the results of the analysis, the cause-effect network is developed until one has reached the core causes.

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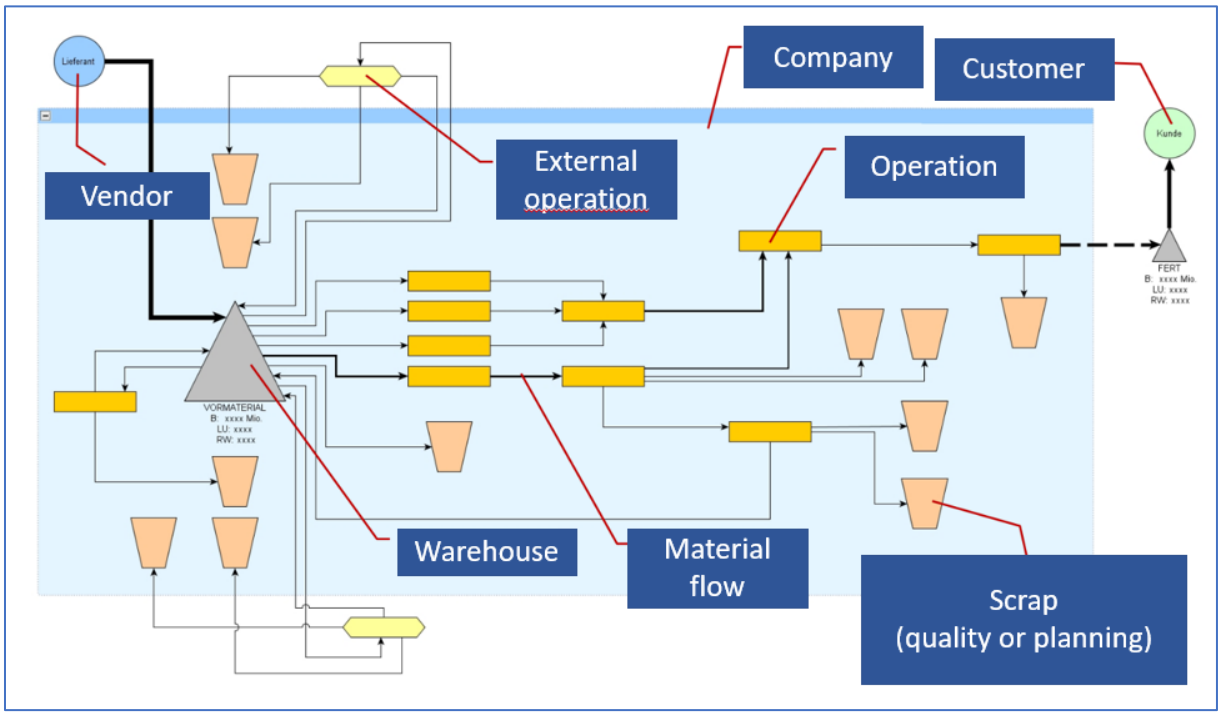

Figure 1: The value stream

The cause effect chain:
"What causes the core problem?"
"And which actions are suitable to attack the core causes?"

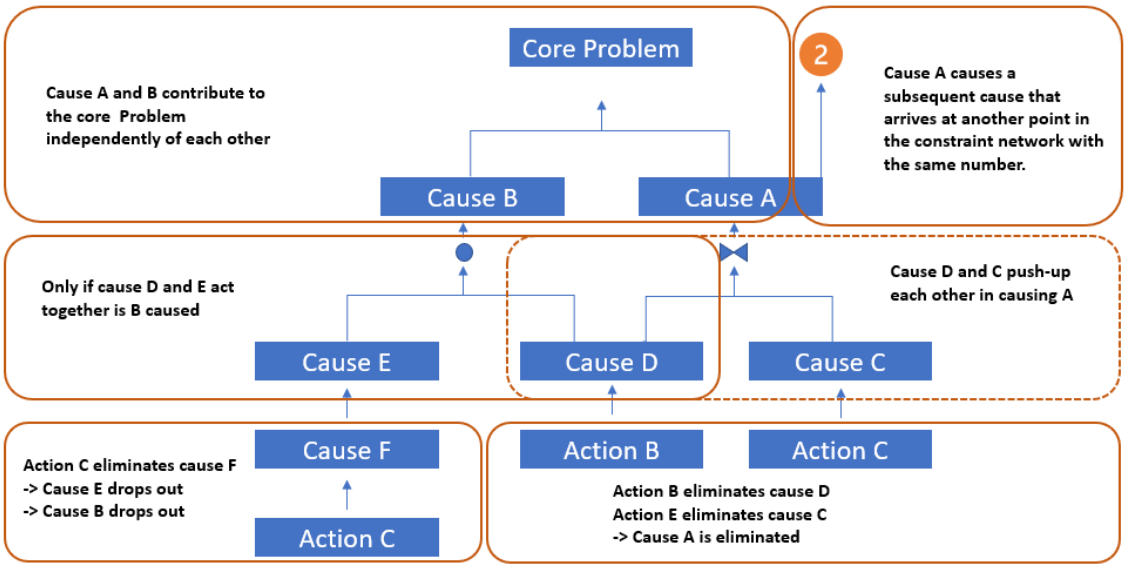

Figure 2: The cause effect chain

Once the core causes have been identified, it is necessary to define levers that are suitable for eliminating the core causes. These levers can consist of simple measures, but can also be independent projects and must be combined into fields of action and prioritised. Prioritisation is important because not all actions can be tackled at the same time, some are interdependent and require different implementation times.

Figure 3 shows an overview of the result of a real constraint analysis on the question, "Why is our delivery performance not as desired?". The graphic gives an impression of the possible complexity of such an analysis and its results.

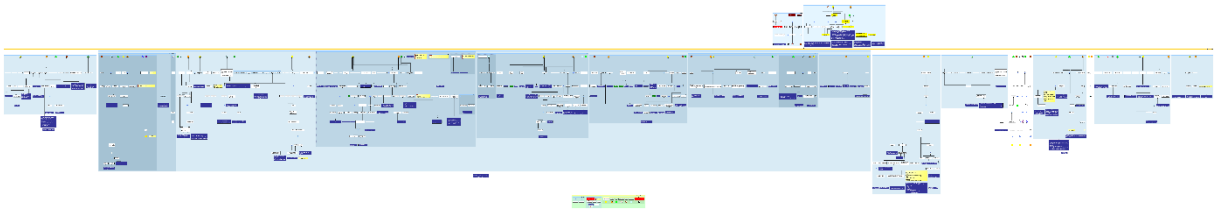

Figure 3: Result of a constraint analysis

In the concrete example, 72 measures were defined within the framework of 13 identified fields of action, which attack the causes of the core problem and thus solve the core problem.

In the gearbox production of a large automotive supplier, we succeeded in increasing the production throughput by 10% by means of a constraint analysis without having to invest in capacity expansions.

No coming to terms with the past, but a constructive look into a better future

The constraint analysis cannot replace the experienced supply chain expert, but it helps him systematically and effectively uncover the crucial bottlenecks and create remedies. The effectiveness of the defined measures is shown in detail in the reality tree, the question of blame and responsibility is nowhere raised, nothing has to be hidden or swept under the carpet.

The elephant-sized challenge is broken down into digestible slices. No one wears themselves out fighting the wrong causes of fires any more.

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