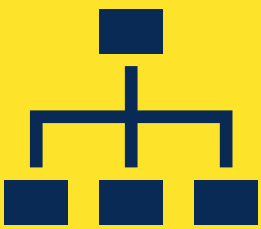
Abels & Kemmner
SUPPLY CHAIN EXPERTS

# WHITE PAPER

## Logistic Optimization Using Empirical Simulation



Was is possible today at the technological forefront of supply chain optimization, what the efficient optimization of logistics and supply chain management has to do with the crash test of car bodies and why a digital twin helps to optimize your logistics business model.

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## Contents




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## Logistic Optimization Using Empirical Simulation

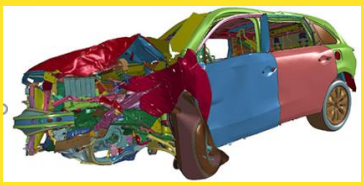
**What is possible today at the technological forefront of supply chain optimization, what the efficient optimization of logistics and supply chain management has to do with crash testing of car bodies and why a digital twin helps to optimize your logistics business model.**

We are all familiar with the dramatic images of crash tests from pictures and videos in which the sheet metal of the car bodies bends frighteningly around an obstacle.

In the past, countless crash tests were necessary during body development in order to achieve the correct torsional rigidity of a body on the one hand and plasticity on the other. This took a long time, was very expensive and always meant a residual risk for the subsequent operation of the car, because it was not possible to optimize down to the last detail. The optimization of bodies has been done on computers for some time now. The body parts are put together using simulation software and subjected to countless crash tests. Test cycles can be carried out much more quickly, optimization can be carried out more precisely and the residual risk can therefore be eliminated more reliably.

Today, the economic optimization of many products and processes can only be achieved by means of simulation: Whereas vehicles used to be improved in expensive, time-consuming tests, in modern body development they are crashed using computer simulation and optimized quickly and cost-effectively.

simulation



fast
reliable
risk-free

test result

slow
expensive
risky

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## Simulation creates attractive perspectives in SCM

What is standard in body development represents the technological cutting edge in the optimization of processes in supply chain management and logistics. Only through empirical simulation can improvements be brought out of the fog of gut feeling and into the sunshine of objective facts. The interplay of value streams, requirements, forecasts and scheduling decisions in a company and throughout the entire supply chain is so complex that it can no longer be understood with common sense and years of experience alone.

Many practitioners know from daily experience how volatile the entire logistics business model is with its value streams, decoupling points, storage levels and planning and control processes:

- There is insufficient ability to deliver despite high inventory levels;
- Scheduling results depend on the individual and change with every staff turnover, vacation or sick leave replacement;
- Improvement processes are slow, laborious and yet not sustainable;
- Priorities change regularly because no one has an overview of the interaction of the processes.

An empirical simulation of the dynamic behavior of the entire supply chain on the computer makes it possible to check the effects of different solution approaches in advance and without risk and to arrive at objective numerical values. This makes discussions more objective, allows consensus to be reached more quickly and thus decisions to be made more quickly and easily. While the classic optimization of logistics processes involves slow, cautious and laborious progress in pilot phases and tests with a few items, logistics business models that have been simulated in advance can be implemented quickly.

Logistical optimization using simulation is not rocket science. It all starts with a so-called digital twin of the value streams and planning and control processes. This digital twin can be generated from the deep ocean of data in an ERP or inventory management system by importing item master data, historical time series of customer orders, purchase orders and warehouse issues, parts lists, work plans if necessary, and other data as required.

While in classic value stream design it can take weeks until a value stream is mapped for selected representative items, a complex logistic value stream model across all material numbers is available within a few days.

## High informativeness and dynamics

And while classic value stream design only works with static average values, the digital model takes into account the dynamic behavior of the materials in the value stream. This not only makes results more detailed and differentiated, but in many cases realistic and reliable. Static average considerations, on the other hand, all too often fail in the dynamics of practice.

In order to simulate logistical effects with a digital twin, the changes to be examined are made to the model and simulated over a defined period of time in the past - typically 12 months. The simulation results can then be compared with the practical results known for the past and thus evaluated.

The simulation approach can be used very broadly. It can answer strategic questions such as optimizing the logistics business model or restructuring value streams. It can improve sales forecasts or planning, balance inventory and delivery readiness, or answer detailed questions.

| From a professional perspective | From a financial perspective |
|---|---|
| Improve forecasts | release liquidity |
| Reduce inventories in the short and long term | Increase sales through high delivery readiness |
| improve delivery readiness | Reduce supply chain personnel costs |
| Increasing data quality in the ERP system | Avoid special trips and penalties |
| Automating data quality in the ERP system | Avoid warehouse expansion |
| Improve overdraft results | reduce ordering costs |
| Dispo results good regardless of person | Increase yield:<br>• Each million stock costs between €190,000 and €300,000 in revenue annually |
| Optimize the logistics business model | |
| automate planning/control processes | |

**Typical simulations for strategic corporate goals**

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The questions can relate to individual, selected or all items and can affect the entire value chain, even across several company levels. They can relate to selected segments of the value chain or just to a single storage level.

Some concrete examples from different industries may clarify the situation:

Years ago, A&K was able to use the simulation approach to show lingerie manufacturer Anita Dr. Helbig that the planned reduction in lead times would have little impact on inventories in the entire global supply chain. An improvement in the sales forecast was identified as a key lever. This measure enabled the inventory to be reduced quickly.

Trost, today a brand of WM SE, one of the leading automotive parts wholesalers in the independent aftermarketing Germany and Europe pursued the goal of largely fully automated replenishment of the approximately 150 branches. Using simulation, A&K simulated the branch's replenishment strategies down to every single relevant planning and disposition parameter for each item and then developed a set of rules for setting the disposition parameters. This has now been in operation for several years and has sustainably reduced stocks by a high double-digit million amount.

Fritz Driescher KG, a medium-sized medium-voltage switchgear manufacturer, pursued the goal of significantly reducing its inventory in circulation and building a more efficient value chain. Using a dynamic empirical simulation of the entire value chain, A&K developed a new logistics business model in which the logistics decoupling points were relocated, an 80/20 leveling system was set up in conjunction with a Kanban system, personnel capacity management was introduced and a scheduling rule set was implemented to tune the ERP system. As a result, the inventory in circulation was drastically reduced and the efficiency of the entire value chain was significantly increased. Without the simulation of the solution concept in advance, the development of the new logistics business model and its implementation would have required significantly more time and effort.

As one of Germany's leading hardware store suppliers, GAH Alberts requires the highest level of delivery readiness. By simulating the planning processes, A&K developed a combination of short-term and long-term measures and implemented them as a planning rule set, which reduced inventories by 53% within nine months.

In cooperation with the Swiss Sihl Group, the key starting points for improving the continuity of the international planning chain were identified and jointly implemented using logistical simulation of the value chain.

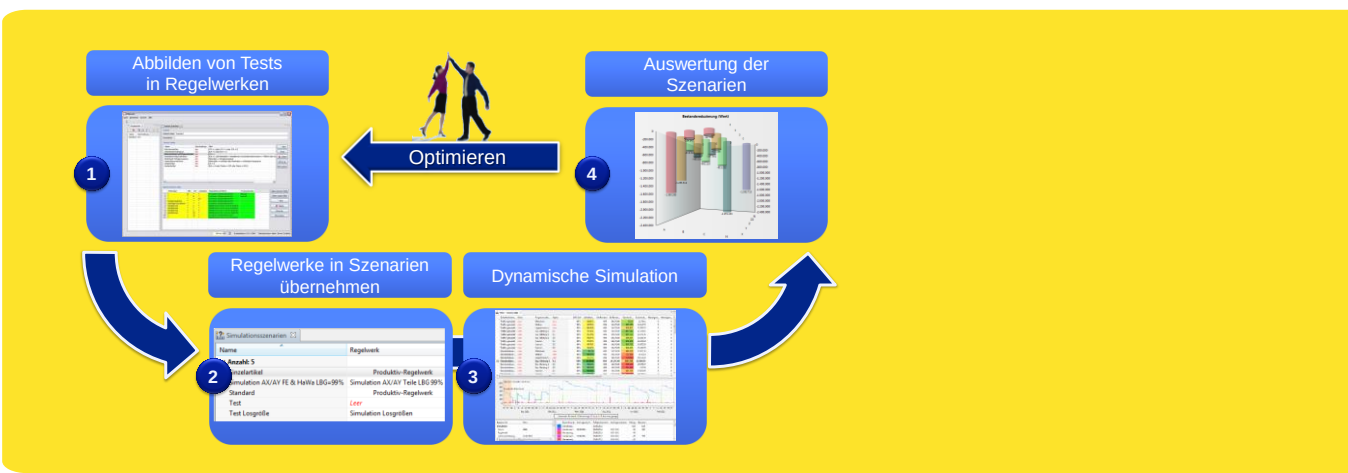
A&K is currently working with a large international manufacturer of technical components on a new concept for the logistics business model with the aim of reducing inventory in the high double-digit million range.

## Iterative Optimization with Intelligence

By and large, logistics optimization is carried out through empirical simulation in several iteration loops. The project team defines solution approaches, maps them in the system and simulates them. The results are analyzed and the solution approach is optimized iteratively. A powerful simulation system can perform some of the optimization tasks automatically, partly using mechanisms from artificial intelligence, by independently determining from a given range of solution variants the one that best achieves a given optimization goal.

The preceding explanations sound a lot like theoretical work on the computer. However, such a digital twin does not spare its users from having to understand the logistical conditions and restrictions in the company. While some of the potential for improvement can already be identified through various tests and simulations on the digital twin, much of the potential only arises from knowledge of the company's situation and the current handling of processes in the company; even the logistical simulation still requires experienced specialists.

A simulation project therefore begins with a process analysis and consists of regular workshops in which optimization approaches are jointly identified and reviewed with the company's employees. It culminates in an action plan with fields of action and sub-projects.

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## Fast results and payback

It is therefore worthwhile to look into digital rather than conventional optimization methods. The advantages are clear. In practical application, it turns out that the simulation approach is usually more cost-effective and more profitable than conventional optimization methods. The cost advantage increases the larger the article portfolio under consideration, because the number of material numbers to be considered has practically no effect on the project effort. In addition, thanks to the faster implementation of the solutions developed, the simulation approach enables shorter payback times than classic optimization projects. This alone means that a typical logistics simulation project practically finances itself.