Experience with anyLogistix Projects

Requirements, Approach, and Results

SimPlan AG
Dr. Till Fechteler

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Introduction Till Fechteler / SimPlan AG

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Till Fechteler

Branch Manager, SimPlan AG
SC Design Projects since 2012

Project Experience

Till Fechteler is an expert in material flow simulation with more than 25 years of professional experience. In addition to his work in the management of SimPlan AG, he is responsible for conducting simulation studies in the areas of supply chain and intralogistics.

Project Examples Supply Chain Optimization and Simulation:

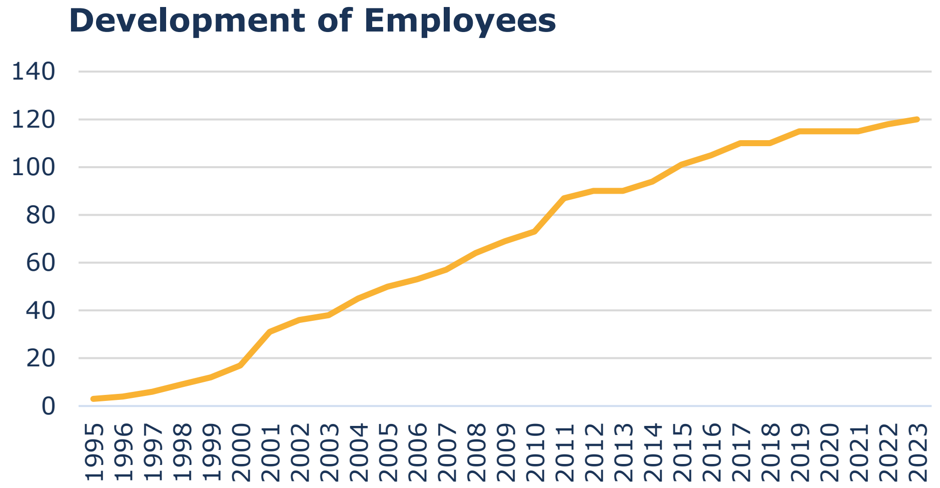
- Simulation of supply chains with a special focus on CO_2 emissions (2012 - 2015)
- Simulation of a supply chain for tyres (2014)
- Simulation of the distribution of consumer goods in urban areas (2015 - 2017)
- Simulation of a supply chain in the furniture trade (2018)
- Simulation of a spare parts supply chain for Northern Europe (2020)
- Network optimization of the supply chain of a building materials manufacturer (2021)

Project Examples Intralogistics:

- Simulation of a cargo center Dubai Airport (2015)
- Simulation of three spare parts centers in the automotive industry (2018 - 2020)
- Simulation of several distribution centers (partly incl. production) in the FMCG sector (2020 - 2022)

Introduction SimPlan AG

- SimPlan AG
  - ➔ Founded 1992
  - ➔ >120 Employees
  - ➔ 12 Sites in Germany



- 16,9 Mio. € Turnover
  - ➔ 50 % Automotive Industry
  - ➔ 40 % Intralogistics
  - ➔ 10% etc.

- Materialflow simulation in production and logistics (intralogistics and supply chain)
- Software sales (AnyLogic, anyLogistix, Plant Simulation, Emulate 3D, etc.)

SIEMENS

anylogic®

Rockwell Automation

anyLogistix

SimPlan

Phases of a Supply Chain Design Project

Phases of a Supply Chain Design Project

Process Analysis
- Requirements
- Understand relevant processes
- Specification of input data

Data Analysis and Transformation
- Understand input data
- Geocoding
- Analysis
- Verification
- Validation
- Baseline

GFA and NO
- Solve location problems

Simulation
- Evaluate processes (sourcing, inventory, etc.)
- What-if scenarios
- Risk Analysis

python™

anyLogistix supply chain software

tableau

Power BI

SimPlan

Requirements

- Target: Find a more cost-effective network variant
- 90% of all projects are about solving location problems (GFA, NO)

- Typical requirements:
  - “The number of possible hubs is limited to ten locations.”
  - “The maximum distance to customers is 250 km.”
  - “The delivery service level should be at least 99%.”
  - “Each store must be supplied at least once a week.”
  - “Up to ten trucks are available for delivery every day. How should the route planning be organized?”
  - “Time windows for delivery should be adhered to for each customer.”
  - “There are various proposals for assigning production steps to locations.”
  - “Some products are only produced three times a year”
  - “Ships cannot dock during high tides. Tank wagons must then be used as a replacement.”
  - “The parts must be transported in special containers, and the return transportation to production must also be planned, as these are only available to a limited extent.”

Data: Specification, Analysis and Transformation

- Input data
  - → Customers (incl. location)
  - → Warehouses, factories, suppliers (incl. location)
  - → Products
  - → Demand
  - → Costs: transport, locations
  - → Products: flows, production, storage
  - → Policies: storage, sourcing, distribution

- Analysis and validation of input data
  - → Developing an understanding of the data
  - → Is the correct data being used (or does the data need to be filtered)?
  - → Correction of the data if necessary
  - → Geocoding

Data: Specification, Analysis and Transformation

- Data transformation
  - → The sheer volume of data often makes simplifications necessary
  - → Clustering: Determine representatives for products, customers or means of transport
  - → Utilization of a Python library to create anyLogistix import files from the input data

When To Optimize, When To Simulate

- Central question: Are results required for processes of the supply chain?
- Examples:
  - ➔ What stock levels need to be configured so that a delivery service level of 99% can be achieved?
  - ➔ How high is the proportion of special deliveries by helicopter to ensure the supply of components to the assembly line?
  - ➔ How often should production planning be carried out?
- These questions cannot be answered with sufficient precision using an optimization model
- Optimization is typical for location decisions that neglect the specific transport, production and storage processes

Project Example

Building Material Industry: Network Optimization

- Task
  - ➔ Optimization of the German supply network of a building materials producer with regard to future requirements.
- Objectives
  - ➔ How should the future German supply network be configured (centralized vs. decentralized configuration)?
  - ➔ At which locations will which article be produced or stored?
  - ➔ How will the key figures (costs, delivery service level, delivery times, inventories) of the supply network change?
- Procedure
  - ➔ Software: Python, anyLogistix 2.14.x
  - ➔ Carrying out green field analyses and network optimizations

Network Facts

- 487 Products (product hierarchy)
- 1.540 Customers (combination 3-digit postal codes and shipping types)
- 7 Shipping types
- 34 Shipping points
- 24 Factories
- 586 Manufacturing cost rates (combination factory – product hierarchy)

- Simplifications to make the model solvable in a reasonable time:
  - → For deliveries of shipping conditions with fixed shipping costs (collector, parcel) a proxy customer was defined
  - → Further compression of the shipping types from 7 to 5
  - → The number of relations has been reduced. This results in a reduction of:
    - → 0.5% of the handling weight
    - → 3% of the transports

Input Data Used for Scenario Building

- Order lines
  - Customer
  - Product hierarchy
  - Factory (for reference only)
  - Shipping point (for reference only)
  - Quantity
  - Aggregated to 5 shipping conditions
- Customers
  - Aggregated to 3-digit postal code areas
- Shipping types
  - Average weight per shipment
- Products
  - Selling price
- Plants
  - Production capacities
  - product range
  - Proportional manufacturing costs
  - Outbound handling costs
  - Geographical location
- Shipping points
  - Handling capacities
  - Product range
  - Handling costs inbound/outbound
  - Fixed location costs
  - Geographical location
- Shipping types
  - Average weight per transport
  - Freight cost rates

Scaling of Order Data

- Procedure for data scaling
  - → Separation of data records by sales organization (SO)
  - → Application of the growth factors within the product hierarchies separately for each SO (duplication of existing order lines)
  - → Merging the data records with new order lines for the two SO
  - → Creation of new deliveries for each customer within the new order lines

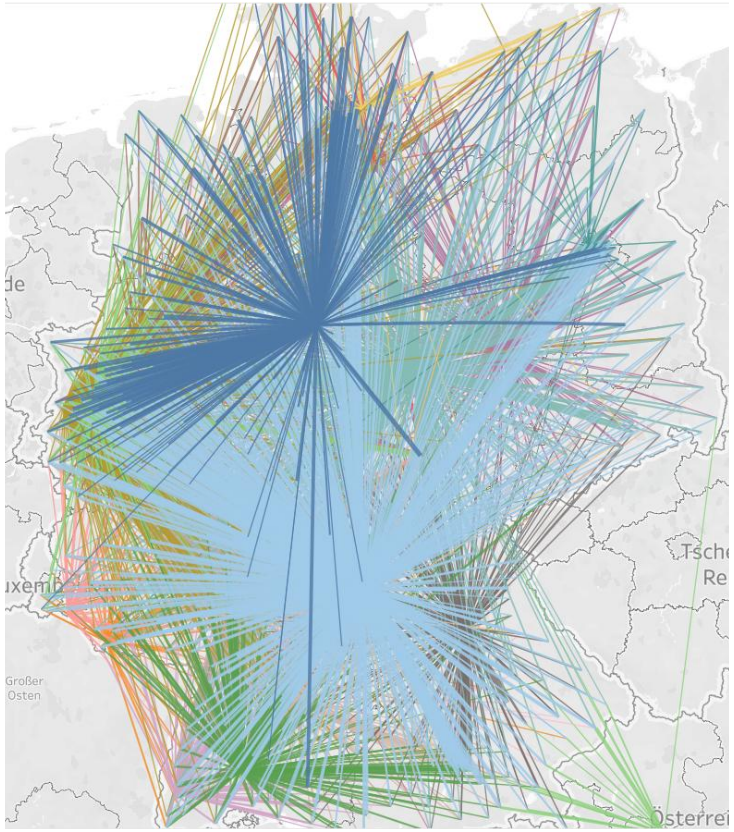
	Growth 2030
Shipments	157%
Pallets	123%
Weight	120%

Results

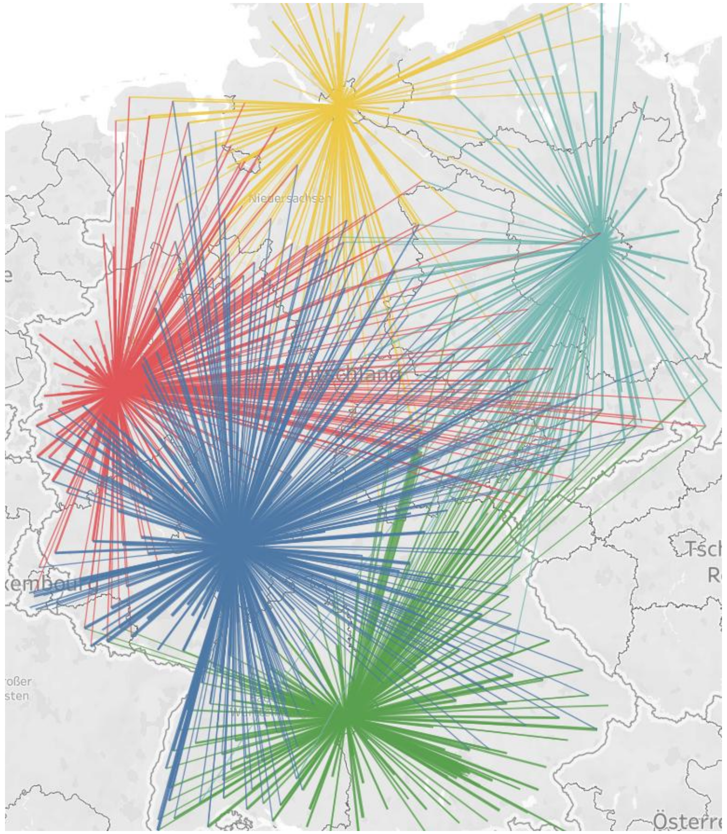
- A purely sales-oriented network structure with, for example, 5 central warehouses is not economical from a transportation cost perspective.
- The separation of customer deliveries between the sales organizations (SO) leads to slight cost advantages for one SO, but has higher total costs.
- The establishment of a CDC west of Berlin and a CDC in the Ruhr region would lead to transportation cost savings of € 3.3 million per year. In addition, 2 existing warehouses would be relieved.
- The exclusive supply of a customer area from only one CDC leads to annual increases in transportation costs of approx. € 1.7 million.
- A central structure with 2 existing warehouses and 5 CDCs would lead to annual transport cost savings of approx. € 1.8 million and reduce the number of active shipping points to 7.

Results

Base Scenario (As is)

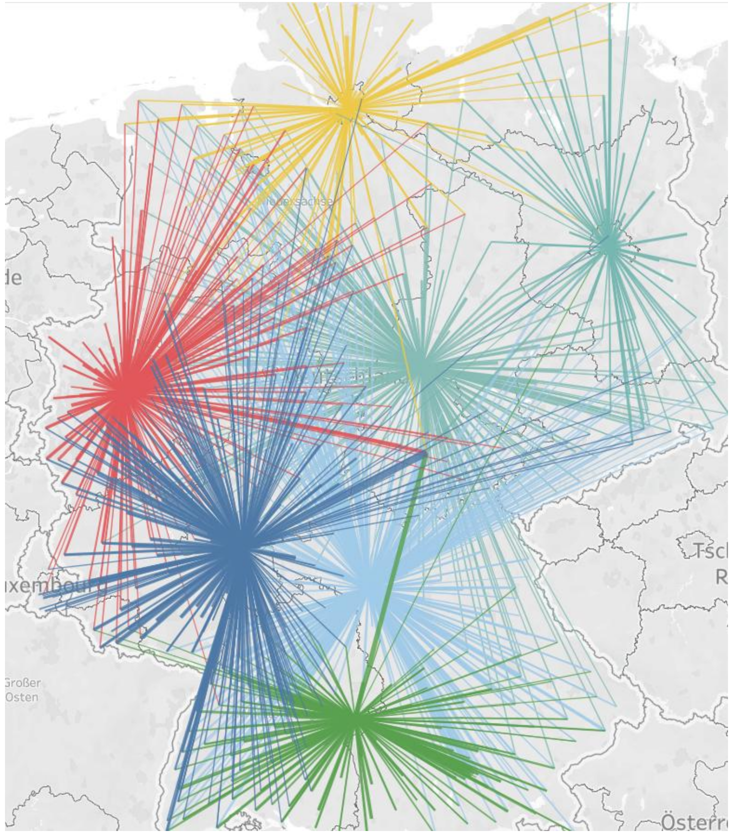


Scenario 7 (5 CDC from GFA)



Cost* difference: + 3.8 Mio €

Scenario 11 (5 CDC from GFA + 2 existing warehouses)



Cost* difference: - 1.8 Mio €

* Transportation and inbound/outbound handling costs

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Thank you for your Attention!

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Videos rund um Simulation:
www.youtube.com/user/SimPlanAG