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Subject Area	Organisation and Processes
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Marco Känzig

# Descriptive and predictive analytics of warehouses and material flows

Statistical modelling, time series prediction and development of a Python-based software tool
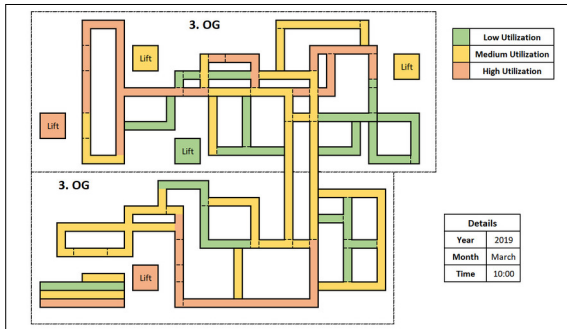

Material flow analysis for a specific year, month and daytime.
(altered data)
Own presentment

Different predictions for the use of a container for the next 10 years.
(altered data)
Own presentment

Problem: With rising customer demand and an infrastructure that is in some cases operating at full capacity, Geberit's intralogistics is increasingly working to capacity. For this reason, Geberit Apparate AG and Geberit Produktions AG had to systematically review the utilization of the existing infrastructure and warehouses. This analysis also included an assessment of the inefficient use of the existing infrastructure based on existing data and by modelling the relevant processes. There was also the question of how and where the infrastructure would have to be expanded over the next few years in order to avoid future bottlenecks.

Approach: The data analysis was performed according to the widely known cross-industry standard process for data mining, also known as CRISP-DM. The process began with thorough data and business understanding and exploration, continued with critical data integration and preparation, and ended with the actual modelling, review and implementation of the model. As a result, the use of each relevant internal and external warehouse was modelled over several years. In addition, the material flow through factories and warehouses was visualized and evaluated for individual parts of the infrastructure as well as for specific materials or product lines. All resulting data were used to create several sophisticated prediction models, which were compared based on a number of statistical selection criteria. On the basis of this analysis and forecast, future demand and thus the necessary investment in infrastructure was summarised. In addition, a tool was programmed and designed that incorporated several of the analysed data in an interactive and user-friendly way, so that users without programming skills could further explore the usage and even import updated data sets for future projects.
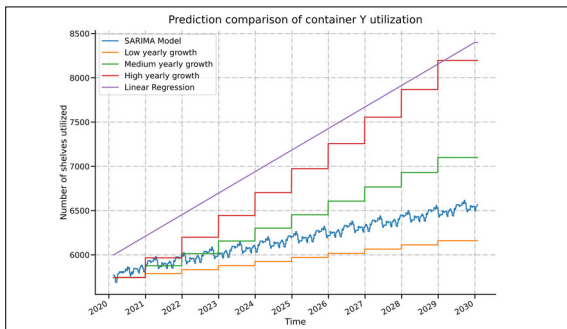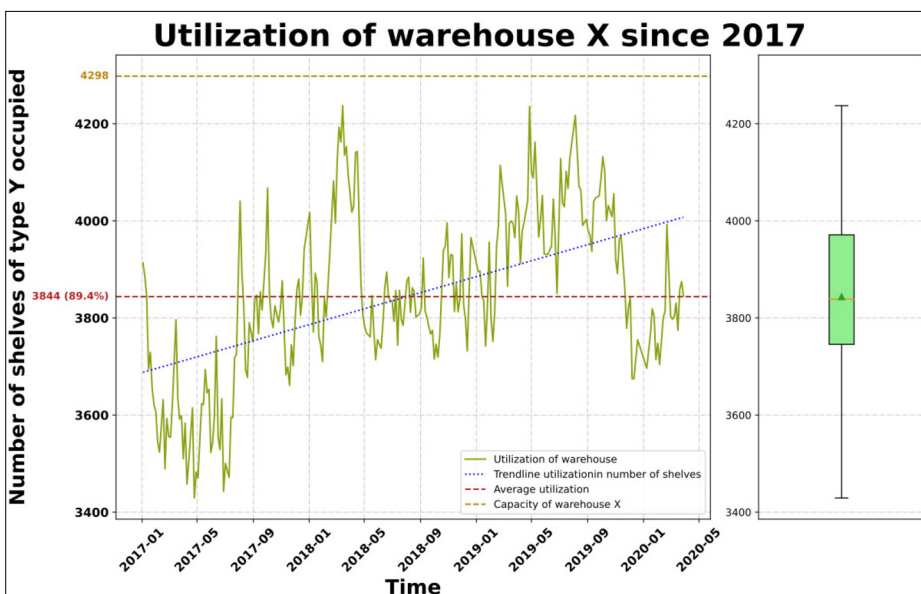
Warehouse utilization of a warehouse with linear trend, capacity and mean. The model has a variety of filters, including products and business units. (altered data)
Own presentment