

FORECASTING METHODS TAILORED TO THE SIMULATION PROCESS

In the simulation optimization of manufacturing systems, demand forecasting is a key input and primary source of information. The behaviour of this information changes over time (short-, medium-, and long-term forecasts) and along the product lifecycle. During simulation studies, thinking in alternatives for optimization is therefore complemented by different demand forecasting scenarios (most likely, optimistic, pessimistic). These variants can be integrated into the simulation model at the 'System Assessment and Data Collection' stage as part of an iterative analysis.

The importance of simulation studies - and thus demand planning - can affect three key areas of corporate operations:

- inventory planning,
- production scheduling and
- supply chain flexibility.

In manufacturing system simulation modelling, the following forecasting models can be effectively applied:

- time series-based models,
- machine learning-based forecasting,
- stochastic and probabilistic models and
- hybrid models.

Among these, this module places greater emphasis on time series-based models.

When selecting the appropriate model, various diagnostic indicators are used: intermittency, Average Demand Interval, coefficient of variation (CV), presence of a trend, and suspicion of seasonality/pattern.

The module presents solutions (theory and computational algorithms) for the following models:

1. Intermittent series: Croston, TSB, SBA
2. Continuous demand
 - a. level models: MA, wMA, SES,
 - b. trend: Holt (DES),
 - c. trend + season: Holt-Winters additive & multiplicative.

Special attention is given to model evaluation algorithms and an overview of error measurement.

It is also useful to review the Model interpretation (quick recommendation from a manufacturing perspective) and the structuring of the analytics maturity model.

The module concludes with a forward-looking solution: a detailed discussion of scenario simulation, covering possible variants of demand forecasting.

Acknowledgments

The project is co-financed by the governments of the Czech Republic, Hungary, Poland and Slovakia through Visegrad Grants from the International Visegrad Fund. The mission of the fund is to advance ideas for sustainable regional cooperation in Central Europe.

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