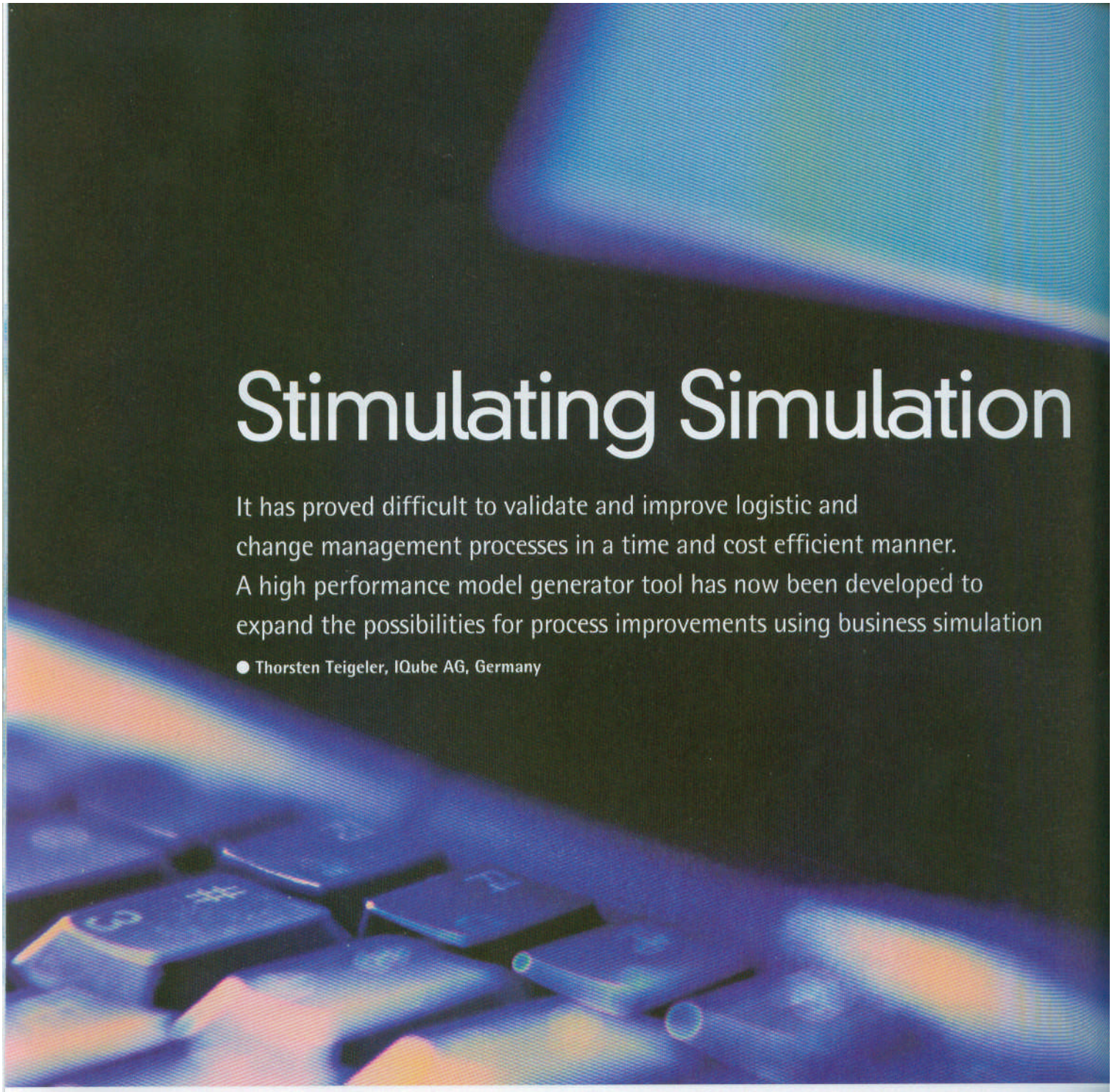

Stimulating Simulation

It has proved difficult to validate and improve logistic and change management processes in a time and cost efficient manner. A high performance model generator tool has now been developed to expand the possibilities for process improvements using business simulation

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The sorting and dispatching of letters and packages is being carried out by commericial service providers more and more frequently, making, speed and reliability the primary goals of any post trying to gain higher productivity. It all sounds ominously familiar, but the needs of the postal industry are formed by these driving factors.

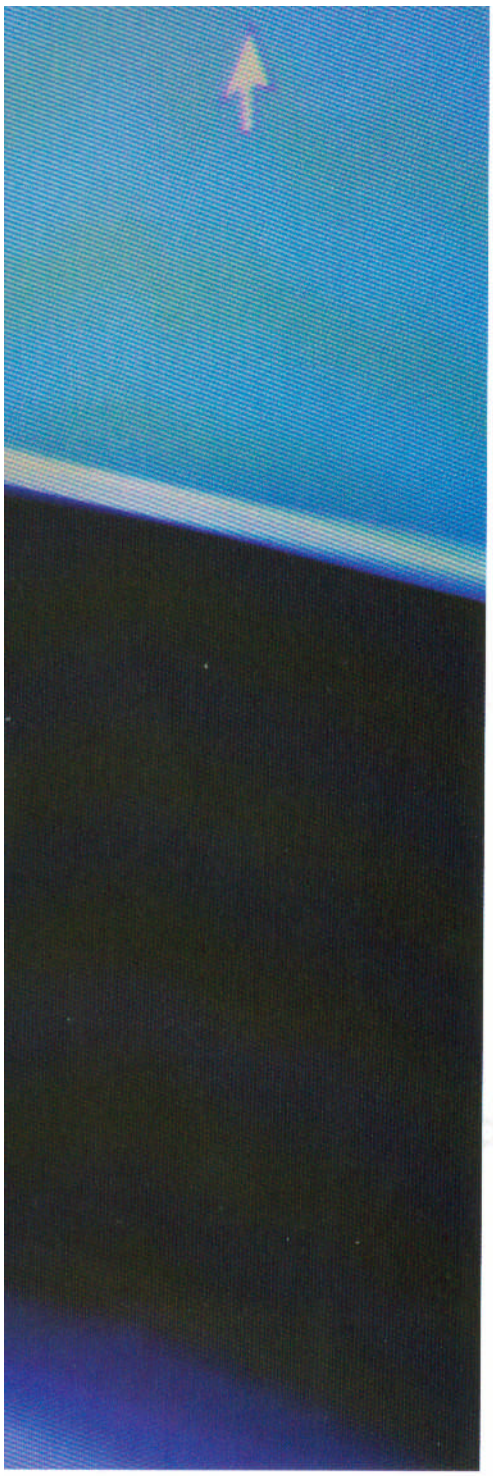
In order to increase reaction speed, transparency or effectiveness in a postal centre, information about the impact of system changes is critical. Long- and medium-term planning forecasts, such as load prognosis, the availability of operating facilities, or the machine and labour allocations are necessary if a post if going to remain a flexible, cost-optimised business. A chief goal must be to obtain optimisation between the different requirements: The detailed, frequent fluctuations underlying mailing volumes, the available machine and personnel resources and the planned and/or assured distribution times. Using resources to their maximum potential in order to achieve reliable delivery is a strong economic advantage often related to high investments in an increasingly harder competitive environment.

The infrastructure

Postal systems are complicated and have traditionally been addressed through 'islands of improvement'. Parts of the infrastructures, plant operation or service standards have been improved independently of each other and at different times. Usually these complex systems are not thoroughly analysed in a structured and integrated way. Until now layout requirements derived, in most cases, from CAD-plans, and capacities are worked out based on simple average quantities, the integration effects of proposed solutions are not taken into account. However, the dynamics of integrated systems require a detailed view of the coherence and the interdependences of the system elements.

Advantages of simulation

The main advantages of simulation are the detection of poor usage rates. This can be caused by a system running to less than its full capacity or because of sub-optimal



routing. Discrete event simulation can cope with these dynamics due to the consideration of time intervals. The key aim is to monitor the alternating effects of the whole system and to reach better decisions.

Simulations can provide many advantages over traditional methods. Firstly, simulations can be applied to existing postal centres as well as in the initial planning phase. They can also be used to perform risk-free 'virtual experiments' regarding the design and operation of a postal centre prior to implementation. The effects of changes in the environmental infrastructure can be assessed using 'what-if' scenarios, and simulations can visualise alternative solutions and predict the future behaviour of a system. Postal centre operators can use the results obtained from a simulation to improve design, capacity and layout as well as economic factors such as necessary investments, human resource costs, etc. For example, simulations can show the impact of a changed programme sequence on the necessary personnel capacities; show the impact of machine failures on the maximum throughput; determine necessary machine capacities to maintain a defined service level, and visualise the effects of frequent fluctuations in mailing quantities. Simulation also delivers support to the management in cases of investment appraisals. It can quantify and understand the advantages and disadvantages of any proposed solutions and predict the consequences of a given solution, becoming a useful part of decision support.

A new approach

In the past, skilled simulation experts were needed to perform system comparisons. German company IQube has developed an approach to design simulation models in less time and at less expense. Based on a model generator tool, simulation models can be created automatically even by 'non-simulation experts'. The tool could implement structural adjustments to the process based on simple modifications to the core database, and it allows a direct comparison with existing models.

All critical input data (e.g. environmental data and system data) are stored in a database with a user-friendly interface. Based on the selected scenario the generator automatically develops a simulation model based on standard simulation software and goes on to process the simulation experiments.

The results from these experiments are captured again in the database from which the user can create reports automatically. This approach has many advantages:

- Standard interfaces to existing data systems;
- Results are easy to re-use for further presentations;
- Ease of application by 'non-simulation experts' leads to higher acceptance;
- Cost minimisation;
- Less effort is required to implement the simulation experiments;
- The possibility of repeating the experiments at any time;
- Avoidance of implementation errors.

Despite these advantages it is recommended the instrument of simulation is used exclusively for problems in complex systems where the system behaviour is theoretically not derivable, or where experiments with the real system may cause unrealistic costs, are too time-consuming, are afflicted with high risks or if real system does not yet exist.

The Vienna distribution centre

This case example is based on the design and launch of Austria Post's mail distribution centre in Vienna, which handles up to four million mailpieces per day in multishifts. Priority and non-priority mail is processed in several sorting procedures.

Due to poor production planning for the individual processing areas and the entire system, the organisation was suffering from large amounts of backed-up mail, especially with regards to priority mail. Changes in shift timing and reversed processing of priority and non-priority mail were supposed to significantly decrease the amount of backup and improve the service level to 90 per cent priority mail delivered the next day.

Any changes to the production planning would have to be tested live in the current organisation and therefore would have caused considerable organisational and financial expenditure and risk. Therefore, it was decided to develop and test alternative scenarios with a simulation model.

Using the IQube simulation method, it was possible to quickly and efficiently develop a simulation model that addressed all issues without risking an impact on the actual workflow of the post.

The implemented simulation model did not only allow the analysis of the existing problem, but also helped to assess the entire impact of changes to the production planning process on the organisation. The model also enabled users without simulation experience to alter the following parameters through a user friendly software interface:

- Number of employees and shifts;
- Staff functions in the individual processing areas (including forklift drivers and ramp workers);
- Timing and amount of incoming mail sorted by priority level, format, e.g. letter size and processing method (machine readable or not);
- Technical equipment in each processing area, including positioning;
- Layout of the processing areas;
- Conveyor technology;
- Sorting methods in the processing areas (including compartment distribution);
- OCR and videocoding rates in the individual processing areas;
- Delay occurrences and duration;
- Storage areas.

Benefits of simulation

It was possible to test potential changes, their impact on individual areas and the organisation in general, as well as improve existing processes without putting the business at risk. Hence, the possibility to test modifications prior to implementation in the real system, prevented disadvantageous business decisions.

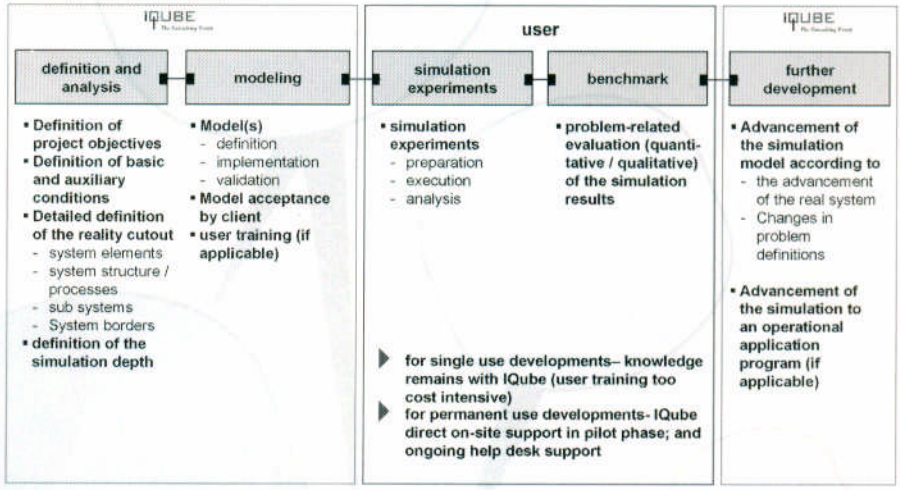
The implemented simulation model was also able to perform a so-called sensitivity analysis, in which the impact of quantitative changes on a structural model was examined. Furthermore, it was possible to modify the structural model and perform automated system comparisons. The model was developed by a project team, following IQube's pre-defined implementation guidelines. After an initial definition and analysis phase, the project objectives and the general conditions were determined together with the customer. Then the project team defined the process that had to be simulated and agreed on system elements, processes and limitations.

Within the actual model development, the team further specified individual modules that were required. This resulted in the definition of the level of simulation, the amount of detail that was to be illustrated, and the adjustable parameters. In addition, the interfaces between individual modules were specified.

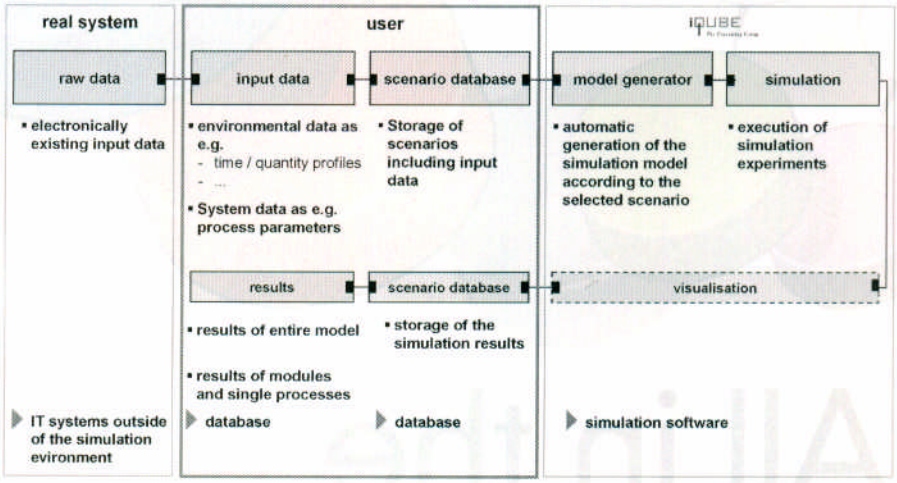
After the initial analysis phase, IQube customised the model generator based on the specifications and implemented the actual module. While implementing the sub-modules, each was individually validated with the support of data from the real processes. Actual data from the real operation was entered into the modules, and the generated output data was compared to the output data from the real system. Finally, the partial modules were integrated into one system, which was again validated based on real operational data. The methodology used for model development included many advantages:

- Minimised implementation work;
- Meant there was no need for simulation experts;
- Provided efficient customisation of the model generator tool;
- Gave the opportunity to further develop the model;
- Could be used for other problem solving projects,

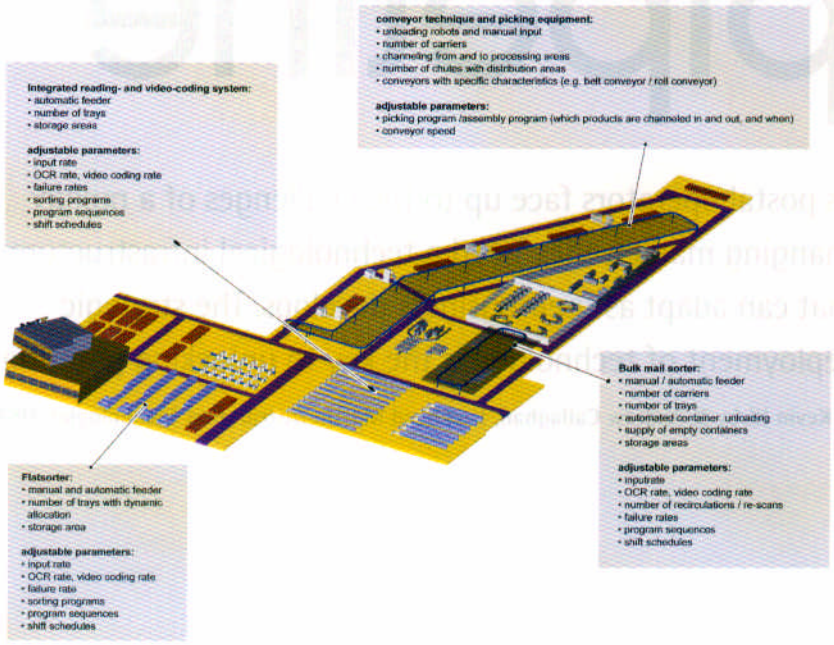
IQube was able to implement a simulation model for Austria Post with reduced effort and cost. As a result, the knowledge derived from the simulation model helped to improve production processes and speed up process times.



Simulation model procedure



Operation sequence



Screen shot of simulation software