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THINKING
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TUI: New control logic tested with real data

Optimization through simulation

The “forecasting” co-worker at TUI was written up back in the 10/01 issue of is report. Recently, TUI has examined its yield management decisions by using simulation techniques.



Fotos: TUI

Travel needs planning. Travel organizations also need to simulate their planning.

In Brief

Simulation project carried out in two months
MS Excel used as front end with real data taken from data warehouse
Motable performance gain with mathematic optimization

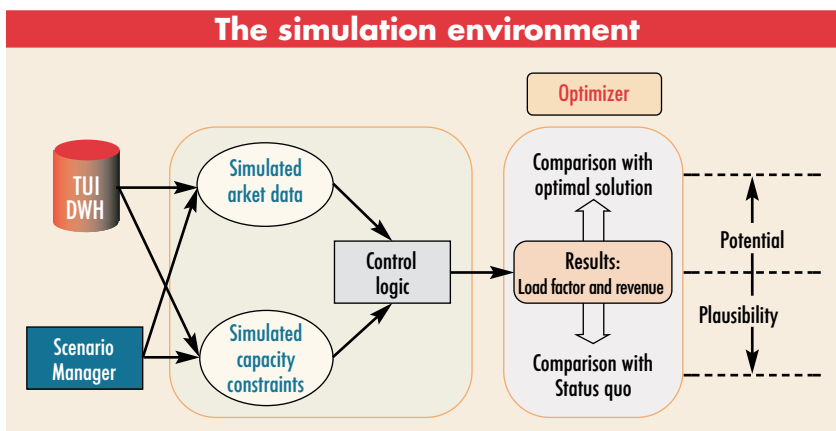
Around 25,000 travel agencies are linked to the TUI reservations system. After reservations have been made, travel information is collected over dedicated and switched lines and transferred to places such as airlines or travel agencies at the target destination. These operational data are drawn on to supply information to the TUI data warehouse, which is used as a basis for detailed analyses.

As a reminder: information technology occupies a strategic position at TUI, the largest tourism company in the world.

The heart: Yield management

In order for travel agencies to make healthy sales profits in times of reduced occupancy and falling profit margins in the industry, companies need to utilize highly intelligent yield management methods. In addition to demand forecasting, the heart of every yield management system at large travel agencies is management and planning logic, which are used to book quotas of seats on airlines and rebook seat reservations on entire aircraft if necessary. Continuous optimization of this control logic is an important task for every travel agency.

To ensure up front that decisions to implement new control logic are sound, TUI asked **Thinking Networks** if it would be possible



to simulate the most critical components of the booking process using real data from TUI's data warehouse – all in a two-month time frame. This exercise required building a simulation environment to support a wide variety of parameter-based scenarios, simulate and process booking events, and graphically display the results. “Consumer behavior has varied considerably over the last few years, which is shown by the booking curves (key words: early and late bookers) for various offers,” says Jörg Remmers, Head of Strategic Yield Management at TUI. The value of products is being determined more and more by the buyer's market, and less by costs.

Building a simulation environment

Thinking Networks has a broad range of methods for data analysis, optimization, simulation and forecasting. As the Aachen-based company already has carried out planning and forecasting projects for TUI, their business processes, IT architecture and data warehouse design are very familiar to Thinking Networks. The simulation environment consists of an MS Excel front end powered by Visual Basic, which allows the scenario manager and parameter entry functions to be quickly and neatly implemented. Support for this is provided by querying the TUI data warehouse.

In a **simulation engine**, simulated market data and capacity constraints are generated for a chain of travel dates, for which complete booking histories are drawn. The process is random, however the user can restrict the framework conditions:

How many participants are anticipated for a specific category? How many participants are booking in the early, mid and late booking phases? The booking events can be processed using various control logics. “First-come-first-served” is selected by default, which of course is followed by the “new” control logic to be evaluated. “The new control logic is designed to take effect where we have high demand travel dates with limited capacity,” adds Jörg Remmers. “A more distributed utilization of capacities helps us to maximize availability for the customer, which in turn reduces the number of times we have to say, ‘Sorry, but we’re all booked up’.”

The simulation engine takes the form of COM/DCOM components, which are integrated in MS Excel. A simulation of 14 flight departure dates along with their entire booking histories is carried out in fewer than 10 seconds, whereby the majority of time is spent graphically representing the booking history.

Simulation results are displayed as economic figures, such as load factor and revenue. These figures are compared for the status quo (i.e. “First-come-first-served”) and the new control logic. In this way, it is checked to see if the new control logic shows an improvement using realistic TUI data. In order to distinguish fluctuations caused by random components from “real” effects in the booking events, the simulation engine can perform multiple tests using specific framework

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*Emel Öz Firker,
Project Manager at TUI*

conditions, with each test using different random figures.

An optimal solution crystallizes which – with respect to all booking events in the selected simulation scenario – represents the best use of all aircraft if this were a real-life situation. As the reservations on the individual aircraft are linked with each other (one-way and round trip flights, trip duration), this situation presents a very complex mathematical optimization problem. The solution involved using Thinking Networks' **TN Optimization Library** to develop an optimizer using state-of-the-art technology. Even the resource intensive parts of the TN Optimization Library are encapsulated as COM/DCOM components and can be controlled from the user front end.

Result: Load factor increases

A total of 240,000 booking events were simulated, processed and evaluated throughout the course of the project. “It was quite impressive to see how quickly the employees at Thinking Networks were able to find a solution tailored to our specific needs using existing tools,” comments Emel Öz Firker, Project Manager at TUI. The initial

results could be presented in less than a month after the project started, with the project goal being attained right on schedule one month later in June 2002.

With a high degree of statistical certainty, a load factor increase of two to seven percent was shown to be possible for numerous routes. Every percentage point is a direct indicator of a performance gain, which, when applied to the entire business, very quickly equates to a six digit boost in profits. Simulations help to better understand the booking process and control logic. One way they do this is by pointing out on which routes the new method is particularly

effective, and where the method should not be used at all.

“Simulation is an important instrument in corporate planning and management, especially when placed in the context of conscientious risk management. Only in this way can new scenarios be played out under real life conditions. With the



With the help of Dr. Wolfgang Konen, Head of Data Mining at Thinking Networks, the company was able to successfully conclude a simulation project at TUI in two months' time

Simulation Engine and the Optimization Library from Thinking Networks, we have two additional high-performance tools at our disposal. The dynamic graphic visualizations contributed considerably to our better understanding of the booking mechanisms at work,” affirms Jörg Remmers, Head of Strategic Yield Management at TUI.

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