The appliance of science to make the right decisions

The power of mathematical modelling in business, and the applied science that is known as Operations Research, cannot be underestimated in today’s economic environment. It is already used in many everyday applications such as configuring computers and moving traffic efficiently. International businesses are beginning to recognise its merits – no more so than for TNT Express, a highly proficient user and leading expert in the optimisation of its global supply chain networks. And TNT Express is this year’s winner of the highly-coveted and internationally-renowned Franz Edelman Award.

“How easy was it to make a good business decision before the arrival of computers?” It’s not a question that’s simple to answer...but one thing's for sure; hardly a decision is made today without one. And the more proficient our computers become, the more we ask of them. What’s the best route to take? How much will an insurance premium be? Will a hub and spoke system save our business money and still enable the timeliest deliveries? Answering questions like these accurately requires mathematical modelling and businesses everywhere are buying into it to add real value to the key decisions they make and gain competitive advantage.

The power of mathematical modelling

For TNT, mathematical modelling and in particular, operations research, became part of its modus operandi five years ago to enable the optimisation of its global networks, hub and depots, and pick-up and delivery (PUD) operations. TNT has worked with Tilburg University Professors and the Dutch operations research company ORTEC to design specific supply chain tools and processes and to date, the programmes that have emulated from the research have enabled TNT to save more than €207 million through better business decision making, reduce the number of kilometres driven by 60 million and cut CO2 emissions by 283 million kilograms.

“The power of modelling in business is immense,” advises Henk Hoornenborg, Global Manager Strategic Development & Analysis at TNT. “No-one can predict the future, but modelling your business enables you to look at different scenarios and simulations in order to gain precious business insight.” One example of this is an intriguing outcome following operations research into TNT’s pick-up and delivery and depot costs. “As a business, we’ve always been aware that PUD was a significant expense to TNT. We undertook modelling to work out how best we could reduce costs and improve our efficiencies in our depots and PUD rounds across Europe,” says Hoornenborg. “The modelling tools and operations research allowed us to simulate various scenarios, and the best outcome revealed that is was actually more cost effective to increase pick-up and delivery costs further in order to save more on depot costs.”
Choosing the tools for optimisation

The GO tools used by TNT include SHORTREC, instrumental in TNT’s refinement of depot activities and events which has delivered savings of €22 million in four years; TRANS, a network routing and scheduling solution which has delivered €48 million in savings to date; and DELTA, a unique supply chain transportation tool which has saved TNT €132 million in four years. MAP & GO is a brand new tool now helping depot managers to optimise their pickup and delivery rounds.

“In all cases, these GO tools are the econometric models that are used to calculate the best optimisation solutions. For TNT, they have to meet many different criteria,” says Hein Fleuren, Professor at Tilburg University. “First, they have to be transportable so that they can be used in different countries, for different networks and even in other organisations. Secondly, and very importantly, despite the complexity of the models, their design has to be user friendly so that TNT’s employees - who are not mathematicians - can work with them effectively. All of the tools that TNT uses in its operations have succeeded in fulfilling these criteria,” he adds. “It’s one of the reasons why TNT’s teams have become so proactive, fast and effective. It helps them to identify many improvements in their daily operations – big and small.”

Effective data crunching

Mathematical modelling is only as good as the data available – and for many businesses, this can be a major challenge. “Historical data held within companies’ data systems is generally good, but it is always necessary to check that it physically fits with real world scenarios. This part of the project is very time consuming, but critical,” says Hoornenborg. “You need to have the right data to make the modelling and analysis meaningful, but too much data can be truly difficult to understand. It is a delicate balance and it takes experience and good communication skills to get it right.”

To overcome some of the data hurdles, TNT works with ORTEC to visualise the data into graphs and maps. “We find this works very well,” says John Poppelaars, Director Consulting, ORTEC. “It’s easy for functional managers working in the field to check the data without being blinded by reams of figures, and they can ‘see’ very clearly where any anomalies are. We then capture the data entry errors so that they are automatically corrected within TNT’s GO data management system for future use.”

Armed to make the best decisions

Another challenge is recognising that the optimal solution is not always the most feasible, and that forecast changes in volumes, fuel costs, pricing strategies can all impact the decision making process. Walther Ploos van Amstel, Associate Professor in Logistics at Vrije University Amsterdam and lecturer at TNT’s GO Academy, coaches TNT students to recognise such situations. “Operations
research is very good at telling us how to optimise a logistics system, but the real business world can be a very different place. My role is to help students enrich the mathematical modelling output by applying tactical and operational planning and control techniques,” says Ploos van Amstel. “These techniques are already used very effectively by armies – training personnel to make the right decisions – and now there’s a growing sense of urgency amongst logistics experts. It’s predicted that, due to an ageing population, there will be 22% less drivers and warehouse staff available on the labour market in Europe by 2020 – all having to deliver the same or more volumes of goods that they do today.”

Ploos van Amstel cites Heinz and Mars as companies which have already managed to reduce their number of trucks on the road, and the time taken to load and unload, by 20% by deploying “speed-docking” techniques and by reducing the number of product varieties carried on each of their trucks. He also cites music festival promoters who are increasingly applying mathematical modelling to better staff bars close to the festival stages. “To maximise margins” he notes, “the productivity of the bar staff is micro-managed… sensor technology monitors crowds’ movements and bar staff are moved around accordingly – receiving messages via mobile phones about where they need to be. This demonstrates not only the need for robust technology and mathematical modelling but also flawless decision making for the planning and control of bar staff according to crowd movement. It is no different for TNT and their supply chains” he explains. “It is impressive to see TNT leading the way not only in its optimisation techniques, but more importantly in training its talent to use the information wisely to make the best decisions for the business.”

“TNT has fully embraced mathematical modelling in its operations and created an ‘eco-system’ within the organisation,” Poppelaars sums up. “They combine the modelling with excellent supply chain optimisation learning through the GO Academy, backed-up by global communities of practice in the workplace, and use the outcomes not only to reduce costs, but also to align operations processes in all their operating units, improve customer service and reduce their impact on the environment.”
About TNT’s Global Optimisation (GO) Programme
Operations Research became part of TNT’s modus operandi five years ago to enable the optimisation of its global networks and local depot operations. To date, the projects that have emulated from the research have enabled the company to save more than €207 million through better business decision making, reduce the number of kilometres driven by 60 million and cut CO2 emissions by 283 million kilograms. The GO Programme is an optimisation “ecosystem” built on three Core Pillars: Supply chain optimisation learning through the GO Academy, modelling through Systems & Technology and global Communities of Practice in the workplace.

About INFORMS and the Franz Edelman Award
The Institute for Operations Research and the Management Sciences (INFORMS®) is an international scientific society with 10,000 members, including Nobel Prize laureates, dedicated to applying scientific methods to help improve decision-making, management, and operations. http://www.informs.org/About-INFORMS.
The Franz Edelman competition, held annually by INFORMS, aims to bring forward, recognize and reward outstanding examples of operations research, management science, and advanced analytics that are used to bring changes to society, industry and business. http://www.scienceofbetter.org/Edelman

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