Top 10 Reasons to Optimize Transportation Planning

An ORTEC White Paper

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Management summary

Advanced Planning Systems (APS) are excellent at helping companies reduce costs. These systems are extremely powerful, processing data and evaluating options much faster than humans can. Cost reduction, however, isn't the only benefit of this technology. APS can be applied to other corporate initiatives, and is particularly useful for identifying new business opportunities. From a transportation standpoint, optimization projects can be grouped into different categories:

1. Increase efficiency of existing planning process
2. Change the current planning process
3. Enlarge the scope of the planning process
4. Launch new business activities

In this white paper, we will share best practice(s) for transportation optimization at both midsize and international companies in various industries. This includes transportation companies and logistic service providers (LSP, also abbreviated as 3PL), but also retailers and shippers. More details, background information, and examples will be given for the various categories, described above.

We will also advise on how to make better strategic and tactical decisions. And, how actual orders help you to influence and optimize operational and real-time decisions to improve both operational efficiency and service to your customers. We will take a look at the positioning of Advanced Planning Systems in the context of other IT-solutions (e.g. ERP, WMS, TMS) related to transportation and how it can empower these solutions. Finally, we explain how it can support specific logistics concepts for sub-industries, such as postal & express, bulk & liquid, contract logistics, groupage, and freight forwarding, as well as for shippers. The purpose of this white paper is to help you discover the multiple business advantages of optimization for transportation companies, logistics service providers, retailers, and manufacturers.

Various stakeholders will benefit from transportation optimization:

- Customer Experience - better customer service via new business activities
- Operations - increased efficiency and transparency of processes reduce operational costs significantly
- Sales - new customer service and business activities will drive revenue and increase market share
- IT - advanced optimization software empowers the ERP, WMS or TMS, while avoiding the risk of replacing these systems, which is costly
- Employees - computed tasks are more reliable taking into account individual schedule requests, capabilities and labor rules
- Corporate Sustainability - improving efficiency is directly correlated to reducing the CO2-footprint

Conclusion?
Both management and shareholders will recognize significant benefits ensuring healthy growth over the long term.
1. Optimization delivers proven benefits

Many companies see current economic conditions as a unique opportunity to redesign and improve internal processes. Research has shown that using Advanced Planning Systems to optimize business processes can reduce operating costs from 5-9%.

Real-world results
- Optimization solutions helped TNT Express save over €200 million ($270 million), earning the company the prestigious Franz Edelman Award in 2012.
- APS helped Coca-Cola Enterprises reduce annual operating costs and improve service quality and sustainability by moving from static to dynamic routing. Estimated savings over the last 10 years total well over $500 million.

Large, multi-national organizations aren’t the only ones who can benefit from optimization solutions. Small and medium-sized companies can as well. For instance, a domestic transportation provider with less than 100 trucks can increase asset utilization by 5% or more. In more complex routing environments, such as the chemicals & petroleum industry, where multi-compartment vehicles are required, even a fleet with only 25 trucks is capable of improving performance.

2. Better decision making

Optimization solutions apply advanced analytics to complex datasets - including data from real-time sources - to improve decision-making. The insights gleaned from these systems can have a big impact on revenue, service quality, and operational costs.

Optimization scenarios
- Small improvements in resource utilization can allow companies to bring on new customers or expand service capabilities while avoiding or delaying additional capital investment.
- By analyzing sales volume and support costs for each customer, companies can develop more efficient service strategies based on account profitability.
- Centralizing the planning process makes it possible to analyze resource requirements at the enterprise or network level, opening up new opportunities to reduce costs and increase utilization.
- Redesigning existing route structures can provide the basis for introducing new service options, like self-billing, which tends to improve invoice accuracy and reduce processing time and internal administrative costs.
3. A standardized planning process tied to KPIs

Optimization solutions help standardize the planning process and provide a central point of communication, making it easier for users to collaborate with one another. This sharing of best practices, personal experience, and insights increases the skill level of the entire team.

Though the planning process might be standardized, planning assumptions can be modified. Users may want to explore different routing scenarios for instance, or adjust plans on the fly due to traffic congestion or bad weather.

Optimization solutions can also be used to define and monitor key performance indicators (KPIs). Plans can then be developed to achieve specific performance targets, rather than loosely defined objectives like “design feasible routes,” “minimize driver overtime” or “reduce transportation costs.” This allows users to focus on identifying and resolving exceptions.

Advanced Planning and standardized processes allow the division of planning activity among multiple users, roles, or job functions. A central key user maintains the central parameters, configuration, and master data. Users see the relevant data of other users, helping them align and optimize the overall process. Operational users are able to plan their daily puzzle in the most efficient way. Tactical users deliver solutions for improving the planning process, analyzing new customers, and answer questions from management.

4. Improved service quality

Industry analyst firm Gartner believes optimizing transportation processes provides several important benefits:

- Better execution
- Cost avoidance
- Partnership opportunities
- Increased productivity & process integration, all leading to
- Increased profitability

Optimization shifts the focus from cost controls to customer satisfaction, providing the tools to help companies launch new services and/or improve service quality. Companies like Carglass (automotive service) and SIRVA (waste removal) are using advanced optimization tools to offer their customers more detailed scheduling options. Other service trends include:

- Offering next day or same day delivery
- Allowing customer to choose specific delivery slots
- Giving customers the ability to track estimated pickup/delivery times
5. **Market conditions are challenging**

The transportation industry challenges include volatile fuel prices, increasing regulations, low margins, and requests from customers for greater transparency (see [1]). Transportation companies simply can't afford to ignore opportunities offered by optimization technology.

The transportation industry, traditionally dominated by relatively small companies, is now seeing a strong trend towards consolidation through mergers and acquisitions. Gartner has identified a significant increase in horizontal and vertical partnerships. There has also been an increase in outsourcing transport from shippers to third-party logistics providers (3PLs), as companies explore the potential for further synergies (see [2]). These industry changes have opened up partnership opportunities that require the kind of transparency and visibility that APS provides.

Gartner expects freight costs, including fuel costs, to show a steady but volatile rise. In addition, mode shifts due to globalization, shorter lead-times, changes in shipping volume, regulations, penalties & surcharges, carrier restrictions, performance commitments, and environmental/CO2 concerns will all affect the transportation industry. These factors increase the need for advanced optimization.

It is expected that transportation volumes will continue to grow 2-3% annually (even assuming 0% growth in the wider economy). As a result of this increased volume coupled with an aging transportation workforce, Gartner expects capacity constraints to begin emerging in the next few years.

Enabling better decision making using more reliable forecasts, and increased efficiency / better service by bringing real-time data into the planning process, Advanced Planning and Optimization will help companies survive and thrive.

6. **Computers increase planning speed and accuracy**

Traditional transport routing and scheduling applications use batch planning algorithms to create an optimal set of routes for each day's deliveries. Running groups of orders through a batch solver does provide more optimized solutions than manually-produced ones. Small problems offer an incredible number of solutions, far too many for an individual to evaluate. Automated routing and scheduling systems can process data faster and evaluate more options that humans, resulting in optimized routes, not just routes that work. Without changing the process or restrictions, adding computing power saves about 5%.

Today’s systems can process larger data sets and incorporate more restrictions / constraints into the planning process, thus reducing planning time and supporting centralized planning. As business becomes more dynamic and volumes more volatile, companies have to make choices between optimal and feasible routes, and adapt the plan/scenario to immediate changes. In response, routing solutions are emerging that can review route plans continuously, making changes as necessary based on real-time input from drivers,
etc. APS is able to deliver efficient and feasible proposals or apply ‘continuous optimization’. The concept of continuous optimization is in particular relevant when supporting typical B2C service concepts, where answers are given directly on the website, app, or from a call-center.

7. Optimization enhances existing management systems

Today, most ERP and TMS systems offer basic planning functions, such as geo-coding, time/distance calculations, a map/Gantt chart, and integration with Track & Trace systems. But powerful optimizers that can assign orders to routes (or routes to resources) using more complex decision-making rules are limited. This applies in particular to ‘last mile’ delivery functionality, thus leaving the last 3-5% of savings unrealized.

Implementing an Advanced Planning System as an add-on to ERP/TMS delivers these savings while leaving the existing functionalities in place. Since the ERP/TMS-system are, in general, the administrative backbone of the company, simply adding the APS, allows companies to capture these savings while avoiding the cost and difficulty of implementing a more robust system.

While WMS focus on managing the inventory and picking process, optimizing efficient loading, routing, and utilization of trucks are more or less beyond their scope. Adding APS increases efficiency by linking the picking and loading processes.

Mobility solutions are becoming increasingly critical to logistics, not only in terms of Track & Trace data, but also onboard computers, scanning devices, and mobile apps on smart phones. Adding optimization power makes them even more powerful. For example, it can send real-time information from the mobile devices to apply continuous optimization, and deliver proposals or the best route back based on this data. Since these requests typically have a peak in the early morning, having optimization power in the cloud is ideal.

Optimization software bridges the gap between more administration-oriented systems (TMS, ERP, WMS) and mobile devices. APS has the lead role in not only optimizing transportation, but also in supporting optimization during execution, thus ensuring that planning and execution work together effectively.

APS supports connection to other systems using real-time interfaces (or complete integration) with both the administrative system and the mobile application, enabling real-time status updates to be leveraged for continuous planning.
8. Optimize everywhere: from strategic to real-time

Optimization solutions improve decision making at any level in the organization, from multi-year strategic planning to daily execution.

Strategic decisions, such as infrastructure optimization (identifying DC/warehouse location, assigning product groups to locations/regional customers to DCs, etc) have an impact lasting many years. For example, if infrastructure decisions overlap a period of ten years, and a 7% yearly growth is recognized during this period, a business will have to deal with a doubling of growth of volume when computing the infrastructure optimization. For this, running various scenarios for volume growth makes sense.

Tactical decisions such as optimizing your fleet, using an in-house fleet vs. subcontractors, and computing the impact of customer changes/new customers typically span a few months. The number of warehouses, drivers, and other logistical staff requires forecasting as well as planning of tasks and work shifts to achieve those tasks. Within the retail industry, for example, it is important to analyze frequency and delivery days (and time slots) of stores at a tactical level. Spreading the workload over the week, clustering orders to create efficient routes, and satisfying customer and stock constraint is the goal.

The operational process primarily aims to create the optimal routes and fleet utilization for the given actual or forecasted orders for the coming day(s). Where order sizes are small and restrictions many, optimization software adds real value. Routes can be created and assigned to trucks based on single versus separate steps. Separate steps are often necessary for timing purposes, where creating routes is important for the warehouse picking process; for centralization where loads can be created at DC/division level, but resources assigned more centrally; and for splitting up tasks so routes are based on maximum efficiency, not driver suggestions or privilege.

During execution, real-time information such as new, canceled, or changed orders from the administration system (TMS, ERP, WMS), changes to the execution itself, delivery sequence, volumes, canceled or refused deliveries, or missed pick-ups is sent to the optimizer.

9. Industry-specific solutions

Advanced Planning & Optimization solutions have been developed to address a variety of industry-specific requirements.

Courier and express delivery

Characteristics of this industry include multi-stop route plans, a critical sorting process, and next day / same day service. Developing efficient line-haul and pickup & delivery schedules is critical. Addressing variations in volume and minimizing changes to planned schedules while still achieving desired utilization and loading efficiency is vital, and require effective operational distribution optimizers. TNT Express captured more than €200 MM ($270 MM) in savings over five years deploying an Advanced Planning System at a tactical level.
Bulk goods and chemicals
One of the challenges in this industry is the number of variables and constraints that must be considered during planning. Multiple compartments, axle weight limits, tank flushing & contamination, route restrictions, safety & security regulations, and other requirements make the process extremely challenging. Throw vendor management inventory requirements into the mix and complexity skyrockets.

The human brain can’t process this much data, but computers can. Technology plays a vital role in optimization. Analytics solutions support demand forecasting, order generation, and inventory routing, as well as load building and vehicle routing. By combining stock replenishment with route planning, companies like Airgas have realized significant savings through optimization.

Logistics providers
These organizations require solutions that combine orders into loads that optimize utilization, delivery clustering, stack ability as well as other loading rules. In retail or production, the warehouse can use the output to initiate the picking process and then to assign loads/routes to resources. 3PLs may opt for a multi-depot approach, so a driver’s shift might include several customers and/or DCs to minimize empty mileage. Moving from a single-depot to a multi-depot solution can save a 3PL over 15%.

Retail
A retailer must first compute the delivery days and time slots per store. Combining daily deliveries with optimal routes, given the more accurate volume and agreed upon time slots is the next step. These routes can then be combined with backhauling from the supplier, returns from stores, combining routes from multiple DCs, applying cross-docking for bundling goods, or to change trailer or driver during the day. Transport optimization opportunities also exist by splitting orders over multiple deliveries and applying top-ups. Businesses can use actual times and volume during execution to re-optimize and deliver accuracy.

Shippers
The decisions shippers face are comparable to those of a retailer: 1) optimizing the best delivery day and time slot; 2) optimizing the daily routing, based on actual volumes and agreed upon delivery days / time slots. Stacking and loading goods, routing, delivery sequences for multi-stop routes, and axle-weight restrictions are all important in optimizing trailer utilization. For shippers, having a good optimization system with which to select the best 3PL for each region and having the tools for dispatch, monitoring, and visibility are vital for the success of their partnerships.

Advanced planning systems are now available which have integrated these industry-specific requirements with the other (more general) routing requirements. The sub-industries, mentioned above, are only examples. Today, other businesses with industry-specific restrictions are supported and optimized by advanced planning software. The have realized a 5 - 10% utilization improvement while improving the customer experience.
A platform for innovation

Increasing complexity, rising fuel and labor costs, changing regulations, an aging workforce - issues like these are already putting pressure on operating margins and cash flow. As this pressure increases and new challenges emerge, companies that can’t adapt won’t survive.

Innovation must be a top priority

Optimization is a source of competitive advantage. Today’s advanced optimization solutions help companies identify expansion opportunities, explore collaborative partnerships, and investigate new business models. They are a platform for innovation, growth, and long-term success.

References


About the author

Goos Kant (born 1967) is Professor of Logistic Optimization at Tilburg University, where he is teaches on Masters courses for the Department of Operations Research, and supervises Bachelors and Masters student theses. He also teaches on MBA courses at TiasNimbas and is project leader of the Dinalog R&D project on improving urban freight transportation.

Goos also works as a managing partner at ORTEC, with global responsibility for all solutions, including for the transportation industry. His primary area of interest lies in optimizing transportation taking into account various related processes in the supply chain, such as warehousing, production and customer requirements. One of his particular current interests is sustainability and collaborative approaches, where Goos sees interesting possibilities for further scientific research and innovation projects.

Goos is also involved in the TNT Go Academy, has been editor-in-chief of the journal of STAtOR (the Netherlands Society for Statistics and Operations Research) from 2006 - 2010, and is a member of ORTEC’s supervisory board. He holds both an MSc and a PhD in Computer Science.
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