The Strategy of Route Optimization

A Market and Strategy Report -

Why Optimize? Or don’t you like wads of cash?

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INTRODUCTION

If you take all of the costs involved in distributing product, there is a trinity of major costs. The largest single component is transportation costs, followed by labor and rent. As demand dripped in the recession operators struggled to adjust costs. Labor as a controlled event within the four walls of a distribution center allows some adjustment. Rent as a fixed cost allows little flexibility to change. *Transportation by far is the largest cost and offers the most flexibility.* In distribution networks transportation is at least one-third the total controllable costs of the distribution operation. In some distribution operations outbound transportation costs alone are in excess of 50% of the total cost.

Transportation is the most flexible of the trinity of distribution expenses, but many operators fail to harvest the most of the potential. *Leaders discover that spending transportation expenses wisely creates a mountain of operating cash.*

Since transportation costs are so dominant, you would expect that distribution and logistics managers would do everything they could to lower costs. All companies focus attention on controlling transportation costs with varying rates of success. Unfortunately, many of these efforts are procurement focused, negotiating the lowest possible rates, and not on more fundamental and strategic opportunities.

Successful effort to lower overall transportation costs must start with strategic efforts. Only so much gain can come from the tactical effort of rate negotiation. Rate negotiation does nothing to address inefficiencies in supply chains that create waste and drive up costs. Strategic thinking and planning is required to improve the value delivered from transportation. *Industry leaders deploy strategy to create massive cash.*

This report discusses the strategy of transportation optimization and highlights tactics logistics leaders deploy to determine and support strategy, discusses why enlightened logistics managers optimize their transportation network, illustrates key commonly used tactics, and discusses available tools.

WHY OPTIMIZE? “OR DON’T YOU LIKE WADS OF CASH?”

The typical answer, “to reduce costs”, is a purely tactical answer. When tactically applied many route optimization systems produce a 5% to 10% cost reduction; never enough return to justify the traditional high monetary and resource investment.

So how do the companies selling route optimization software get away with making claims of 20% cost reduction? Well, the easy answer is their initial savings can be quite steep. If you
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have been routing your fleet with the traditional pencil, paper, and map, it is easy to obtain a one-time cost reduction of 20% to 25%. The trouble with the traditional legacy optimization systems is the high investment where, even a one-time savings of 25% is not enough to justify investment. Without a strategy the savings stop after the first year.

From our experience, a strategically planned and well-executed optimization deployment can create a 50% cost reduction. Savings come from not only delivery efficiency. There are also other hard benefits. Initial fleet operations cost reductions are just the beginning. A strategic deployment of route optimization increases profitability through better utilization of assets and expenses, identifies areas of open capacity to sell into without adding additional costs, and helps determine pricing for adding new territories and customers; all of which drive up profits and cash flow creation.

The right answer is: Strategic Route Optimization Creates Cash.

THE STRATEGIC ANSWER/GOALS

Reducing costs is just one strategic goal. It is an important goal that, by itself, does not accomplish much. For route optimization to be a game changer, it must address multiple strategic goals. The right optimization strategy and tools can deliver greater capabilities and produce a better advantage. Strategic goals to consider include:

- Use all of the available resources, including drivers and equipment.
- Create more customers.
- Improve customer happiness.
- Increase market saturation.
- Forecast expense and opportunity impacts of new customers.
- Modeling opportunity impacts of inbound freight.

Route optimization is a game changer when strategically deployed. To look at it as a cost control tool is like using a pocketknife to cut the steak – it will work but not as well as a steak knife. When strategically deployed, optimization highlights opportunities to pull cost and friction out of the whole of the operation to lower cost and open capacity.

Leading supply chain managers use route optimization as a daily planning tool and for long-range planning and strategy development. A robust optimization tool provides enlightened logistics managers the ability to ask questions about thorny issues such as:

- What are the transportation benefits and risks of acquiring a competitor?
- What are the costs and service aspects of opening an additional warehouse operation?
- How does changing the vehicle type used in the fleet affect service and cost?
- How will a larger class of truck affect our costs?
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- How does transportation regulatory changes such as the hours of service rules impact us?
- How much cost offset is provided with vendor backhaul programs?
- How can shifting delivery territories between facilities help us?

These are just some of the strategic questions answered using a route optimization tool.

**WHAT TOOL TO USE?**

Think about the toolbox you have in your garage. Mentally open that toolbox and identify the tools in it. A basic toolbox will have a hammer, wrenches, screwdrivers, pliers, a saw, and other assorted tools. Each tool has an intended purpose. In addition, each tool can be used for different purposes – with subpar results.

**USING PLIERS IN PLACE OF A WRENCH.**

At some time or another, all of us faced the dilemma of not having the right tool for the job. How many times have you faced a nut or bolt holding a pair of pliers in your hand? How many times have you used that crescent wrench to drive a nail? (Is the young lady actually holding the right tool for the job?)

The same issue applies to optimization tools. Some route optimization needs are very simple: what is the shortest distance of travel between several points? Other optimization needs are much more complex or complicated, so choosing the right optimization tool is very important. While you can use Google Maps to route a simple number of stops, that tool cannot tell you the proper order for the stops. Using this Google Maps to schedule deliveries is like using a tack hammer to drive a framing nail; you can do it but only with extreme effort.

Understanding which tool to use requires understanding first what you want to accomplish, then the capabilities of the tool. There are ample examples where companies invested in expensive optimization tools only to apply them to create static routes. There are just as many examples where companies invested in the cheapest solution they could find only to discover that they could not solve their problems, or their problems became worse.

We do not believe there is necessarily a "bad" or "good" tool. Is there a "bad" hammer or a "good" screwdriver? Just as using the wrong tool to fix the tree house, choosing the wrong optimization tool for your needs is a mistake. In this report, we discuss the basic types of solutions available in the market and how they are used.
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History Matters:

To understand the capabilities of different route optimization tools available on the market, you should understand a little bit of the history behind the art and science.

In the Beginning...

In the beginning, with maps, pencils, paper, and an adding machine, a dispatcher would mark off customer stops on a map. Knowing about traffic patterns and perhaps the desired time of delivery, they determine the priority of the stops. Using the mileage as marked on the map, they record the point-to-point mileages on paper and then add them up. This as the Mk.1-HRM (Human Routing Machine) – AKA: The Transportation Manager or Dispatcher.

The Mk.1-HRM is a flexible tool but not very fast and accurate. As long as the routes are simple, they do a fine job. Their answers get better through feedback from the customers and drivers as they learn and understand more about the nature of the route and the desires of the customers. When the route goes about four or five stops, the HRM begins to slow down. If the planned number of routes is more than a handful, the job becomes harder for the HRM; add in daily changes and the job gets even tougher to perform.

Many companies still use the HRM for transportation solutions. They are easy to program, somewhat easy to maintain, and are often considered by management easy to replace. That last assumption by management is often a mistake.

There are upgrades to the HRM. They can use spreadsheets to replace the adding machine and paper. They can now deploy other tools, such as Google Maps or MapPoint to replace the use of paper maps and mileage tables. However, in the end, complexity and size limits the HRM.

The HRM methodology has other problems. HRM’s do not always follow the same process—day in and day out. Being human—they forget critical steps. HRMs do not always create the best solutions. HRM’s typically look at routes and try to make them look "pretty." HRM's tend to fall into patterns of thinking and, once they have grouped a number of customers together into the same route, they typically keep those customers in the same route. HRM's will typically think of delivery routes that look like the petals of a flower - the center of the flower is the originating distribution center, and customers are located within the petals. These routes are not effective in customer service, on-time performance, or cost.
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Then Came the Computer:

The original deployments of route optimization software used a form of problem-solving called heuristics. Heuristics employs linear programming processes that generally follow accepted rules of thumb. The infamous traveling salesman optimization is an example of a heuristic model. To create the tool a programmer observes an HRM doing their work, asks questions, takes notes and then designs a process that mimics the HRM. The processing capability of early computers limited the capability of original heuristic systems, so while they could solve simpler problems, they could not solve complex problems. These expert systems are limited by the expertise of the HRM’s rules of thumb.

These first-generation route optimization systems do an adequate job of coming up routes that reduce miles. Some models can calculate an expected arrival time for the stops in the route, and some can calculate a rough cost estimate for the total trip. As long as the variables remained manageable and the optimization goal focused on the least miles traveled, these first-generation systems worked. These are the core of portable GPS and Google Maps. Stop and think: How many times have those systems suggested a route that you knew would take more time? They were like a pair of pliers, fine for twisting wire but not for turning a bolt.

As more limited variables and conditions come into play, the heuristic models fall short of expectations. Customers want specific delivery times. Some roads do not allow truck traffic. Some parking areas cannot support larger trucks. Traffic congestion increases or decreases travel time across the same road at different times of the day. Driver hours of service rules change. Customer order sizes are volatile and order patterns change. Fuel costs change.

As heuristic models become more complex with more constraints, they become complicated, and the models must address more constraints and make more decisions. The software and algorithms that actually solve these problems, becomes intensely complex. These problems become too much for the heuristic model to solve. Conflicting rules and dueling goals send a heuristic model into never-ending iterative loops. Systems that use "mathematical programming" algorithms (i.e. linear programming, mixed-integer programming, etc) attempt to optimally solve a relatively complex mathematical equation. This is old-school Operations Research--take a real-world problem, "fit" it to a mathematical equation, solve the equation, and then "fit" the answer back to the problem. The real difficulty is in the "fitting."

Users complain about the amount of time it takes these complex legacy systems to solve more complex problems and become frustrated. Just like looking at a frozen nut with only a pair of pliers, many of today's transportation managers attempt, with great effort and pain, to solve complicated problems using 20-year-old software technology. When it does not work and there is a deadline they resort to “manual override” and use the Mk1 pencil.
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STATE OF THE ART – GENETICS:

As computer systems became more powerful and mathematical theory progressed, a new form of optimization appeared with the new millennium. As microbiologists studied genetic code, mathematicians started to develop ways to define genetics mathematically. That study led to the application of genetic processes to problem solving - the Hybrid Genetic Algorithm (HGA).

The HGA approach builds the complex rules that control the problem in the primary solver. This eliminates the difficult concept of "fitting" the transportation routing problem to a standard problem, making HGAs flexible.

HGAs use constraints and goals to define the modeling problem. Heuristic models only use constraints. A constraint is a binary condition – yes or no, true or false, greater than or less than. Multiple constraints conflict, and a model stops when unable to resolve the conflict. Goals overcome conflict by allowing the user to set how important a goal is in relation to other goals, mimicking the judgment of a HRM.

An example of a constraint could be a customer delivery rule – no deliveries after 10 AM. If a customer calls in a last minute, fill in order that misses the scheduled route – a constraint based system will roll the order to the next day. For a HGA based system, the delivery window goal could be deliver between 7 AM and 10 AM, but the last minute order could be assigned to a later truck on a different route the same day – meeting the customer’s needs.

Another example is the capacity release truck constraint. Assume you want to dispatch trucks when they reach a minimum of 85% of capacity. In a constraint based system the truck will not release until it reaches 85%, but a goal-based system will release the truck at the end of the model run to ship the goods on schedule because on-time is more a more important goal than 85% truck fill. Goal-based systems may choose to “break” territories and move the orders to other routes to meet more customer delivery windows. Goal based HGA systems improve both fleet performance and customer service.

Genetic algorithms address the need of “fit” by allowing flexibility in the specifications of the problem. The best HGA-based systems allow for multiple testing of different solutions without changing the “production” system – not changing the routes that are actually running. Some users of HGA systems take new orders and add them to an existing solution to “see” changes beforehand. They can choose to accept the system suggested solution or make changes to the settings for that route and run the model again. Genetic algorithms are very good for dynamically routing freight to existing loads by using the same model engine to determine the best routes to add new customers or orders to when looking at sales expansion opportunities. HGA based systems create the opportunity to improve customer service and add sales revenue without adding excessive operations costs.
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TECHNOLOGY – “IN THE CLOUDS”

Software as a Service (SaaS, pronounced “sass”), sometimes referred to as “software on demand,” is software deployed over the internet. With SaaS, a provider licenses an application to customers as a service through a subscription in a "pay-as-you-go" model. This approach to application delivery is part of the utility computing model where the technology is in the "cloud" accessed over the Internet.

Top 5 Benefits of SaaS:

- **FLEXIBLE** - SaaS runs on any platform...Linux, Mac or Windows.
- **ECONOMICAL** - SaaS runs on web browsers on any computer.
- **CURRENT** - SaaS service providers constantly updates the software.
- **PORTABLE** - Access anywhere the Internet is - even smartphones.
- **EASY** - No IT infrastructure required.

Business professionals increasingly look to SaaS as an attractive lower-cost way to obtain needed systems — an alternative to a traditional license based application. A well-designed and priced SaaS system provides license benefits without the complexity, internal support, ongoing maintenance expense and the capital requirements. SaaS implementations deploy more rapidly, allowing companies to harvest opportunity cost from the implementation of traditional systems.

SaaS providers generally price applications on a per-user basis and/or per business basis, sometimes with a relatively small minimum number of users. SaaS vendor revenue streams are initially lower than traditional software license fees, but are also recurring, and, much like maintenance fees for licensed software, more predictable.

A recent Forrester Research report, The ROI of Software-As-A-Service, examined a range of companies that chose SaaS solutions and found that SaaS creates long-term value. Companies interviewed cited several reasons for ROI of SaaS including:

- Rapid deployment
- Increased user adoption
- Reduced support needs
- Lower implementation and upgrade costs.

Implementing a SaaS approach for business systems releases working capital because you pay for the service as you use it, not up front. SaaS eliminates long-term commitment risk. Faster implementation allows a business to reduce lost opportunity cost for faster returns. Modern interfaces streamline adoption and training because users are familiar with the interfaces. The subscription expense is a normal business expense without the typical depreciation expense of traditional software models. Smoother adoption allows for faster ROI. All of these factors build free cash flow.
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**THE 5 MUST DO’S OF STRATEGIC ROUTING MODELS**

The challenges facing today's transportation manager are vastly different from 20 years ago. Today, customers expect deliveries within tight time windows. There are 2 to 3 different routing options between delivery points. Sometimes the option with the most miles takes the shortest amount of time due to congestion. Getting the truck to the ultimate delivery point is more challenging than ever. Regulations for the hours that drivers can work and trucks can operate (think of the NYC truck restrictions) add another layer of complexity. These are not just execution issues – they are factors that affect strategic planning.

Company sales and marketing teams task their transportation managers to forecast the delivery cost to a new customer. Intense market conditions and competition intensify pressure where a 1% difference in total cost can mean the difference between winning or losing an account, or the difference between making profit or losing money. Sales professionals turn to the transportation manager asking for a commitment on when trucks will arrive and hold the transportation manager responsible if the time is inaccurate.

Based on extensive experience (over 15 years) of transportation optimization and our ongoing research in the marketplace we developed 5 core requirements that a route optimization system must meet to be considered a strategic tool.

**The FIVE MUST DO’s of a strategic route optimization system:**

1. **The system must support “what if” modeling** using production data without altering current plans or operations.

2. **The system must be flexible.** Changing variables should be easy and the system should allow for multiple scenarios.

3. **The system must allow rapid update and change.** Customer data should be simple to enter.

4. **The system must integrate with all other company systems** including order management systems, the warehouse management systems, with GPS systems, purchase order systems, and federally mandated electronic on board recorders systems.

5. **The system must be FAST!** Complex modeling solutions should take no more than a few minutes to solve. Imports and report generation should be instantaneous. The entire process of importing late orders for assignment to existing routes must take only a few minutes.

Strategic models must be far more advanced and flexible than the majority of the routing models available on the market today. Changes in technology that allow for cloud computing and high-speed data communications have created an environment where strategic models are now available at price points far below existing traditional models. Strategic models cost the same as the traditional models, but deliver massive value through their flexibility and speed.
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WHAT THE LEADERS DO - SURVEY SAYS...

We conduct an ongoing market survey of distribution companies (in multiple industries) that operate their own delivery fleets (or control a dedicated 3PL delivery operation) to understand what tools the market is using for optimization, how they use the tools and how happy they are with the tools. While our research is ongoing we can draw strong conclusions.

*Our market research shows that the predominant routing tools in use today for small- to medium-fleet operations are PC-based heuristic models, but a growing trend of leading companies are moving away from legacy heuristic systems and adopting the latest HGA systems.*

WHY HEURISTIC MODELS DOMINATE THE MARKET - A FADING TRENDS

The market domination is due to the extensive length of time that this type of model has been available on the market. Large portions of these traditionally licensed, PC-based systems have been in use between 7 to 10 years, some longer. Even with upgrades to the user interface, maps and highway data, the basic solver engine has not been substantially changed or upgraded. The logic remains the traditional heuristic rule of thumb system.

Some users of these legacy systems indicate, "Life is bliss". Some blast the system in private but praise it in public. When we scratch beneath the surface, many unfulfilled desires appear, including:

- Difficulty adding in last-minute orders and making last-minute changes to routes.
- Difficulty optimizing across territory lines.
- Difficulty using the system to model "what if" analysis without losing or changing the current delivery route plans.

Very telling and interesting in our research is evidence that most legacy system users run static plans - they do not attempt to use the systems for dynamic routing, late order or add in order optimization. When they need to make a change or add a stop to a route the user does not attempt to use the routing system to find the optimum route - they just manually add it through their warehouse management system (WMS) or use the “Mk-1 pencil”. Users explained that adding a stop or making a last-minute change took so much effort and time that it was better just to do it "with the pencil". One user told us, "We run the same routes every day all the time. You could call it SRDD – Same Route and Different Day." Another user employed more colorful language when they described their operation as SSDD.

When we asked users about their ability for redefining territories, most indicated that they do not attempt to use the routing system to do the planning but define the territory in advance using a map, then manually change customer delivery assignments. A few users indicated that they attempted to use their legacy system to reassign customer points between warehouses but found this difficult to do with their production systems.
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THE MOVE TO HYBRID GENETIC ALGORITHM MODELS

Companies using HGA-based systems tell a completely different story. These companies migrated from the legacy system to take advantage of the benefits:

- Adding in last-minute orders and making last-minute changes to routes.
- Abandon delivery territories to create more route flexibility and provide “customer desired” delivery to improve customer happiness and retention.
- The ability to use the system to examine the effect of new customers on current delivery route plans. They also use the system to evaluate the utilization of different sizes and classes of equipment to determine the cost effectiveness and the service improvement of introducing different equipment types.
- Balancing demand across multiple facilities to help balance work – or to provide better fill rate and inventory balancing without inter-facility stock transfers.

The companies that use SaaS delivered HGA-based systems report that they achieved extremely rapid payback and high ROI. Users report paybacks of the total cost of implementation (set-up, integration, and training) under 120 days with the subscription-based plans. They report sales and territory growth coupled with bottom line and cash generation growth.

CONCLUSION

Leading distribution companies view route optimization as a strategic tool. They use route optimization tools for strategic planning to answer key questions that build their competitive ability and profitability. These leaders use optimization to examine opportunities to add new customers, search for pockets of opportunity in existing markets, and to open new markets, or pick up large multi-unit customers.

Leading distribution companies use route optimization tools to improve their daily execution – to adjust for the daily volatility of their customer’s needs and to identify opportunities to lower execution costs and improve service. They select tools that are flexible, fast, and allow for the rapid update of last minute customer orders to help expand business. They use these systems – with laser focus on execution feedback – to improve the class of service to their customers – delivering on time every time.

Leading distribution companies use route optimization to improve their business performance – grow the top line, harvest more from the bottom line into cash, improve the return on assets, and grow massive cash.
Who We Are

With 25 years of developing, managing, and leading strategic logistics projects that generated over $250 Billion in total impact, including the design, specification, and project management of 34 distribution center implementations, David K Schneider is recognized for his deep experience and knowledge, coupled with his unique ability to build and optimize logistics to their fullest.

In 2006, David started to take small advisory consulting engagements on an informal basis. By the end of 2007, David accepted five assessment engagements. In each of these engagements David thoroughly reviewed facility or operations of the individual client and then presented a report of actions that the client could take that would have a dramatic impact on the productivity and profitability of their operations. In the fall of 2007, David incorporated the company. In January, 2008, he "walked away from the perfectly good paycheck" and officially opened the doors to David K Schneider & Company.

Today, the company maintains its focus to expand services to small and middle market distribution, wholesale, manufacturing and retail companies. Our focus is on the privately held market — where we can aid the family owners, partners and equity groups to unlock powerful profit growth and generate massive cash. Our team of strong and passionate partners come with varied and complimentary skill sets. We have a remarkable breadth of expertise encompassing all facets of logistics and supply chain.

The claim we make, stand behind, and can substantiate is:

**There is no logistics problem we haven’t seen and overcome, and there is no logistics operation we can’t optimize to create a 50% increase in productivity that generates massive cash.**

_The tenet we operate by is that we do not have customers, we have clients._

_Our clients are people, not companies._

_Our mission is to create wealth for our clients. We do that by guiding and coaching those clients to take action to improve their business, providing care guidance and protection that can only be delivered by consummate experts in our field._

_Technical ability is not enough, we must understand._

_We must create and deliver change that improves their profitability and cash generation._

Reducing your costs and spending your transportation expenses wisely would create mountains of cash for your company, too. Want to know how much you’re missing out on? Call us and we’ll help.

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