

ARC BRIEF

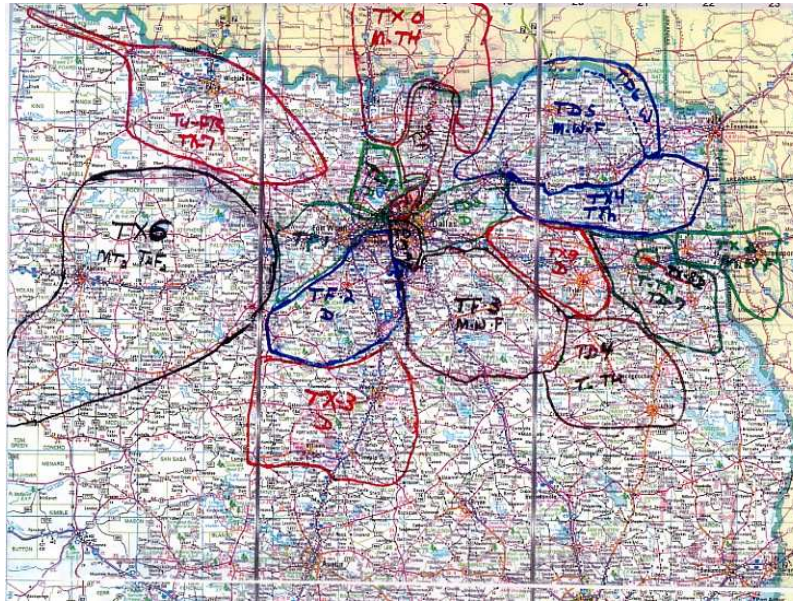
By ARC Advisory Group

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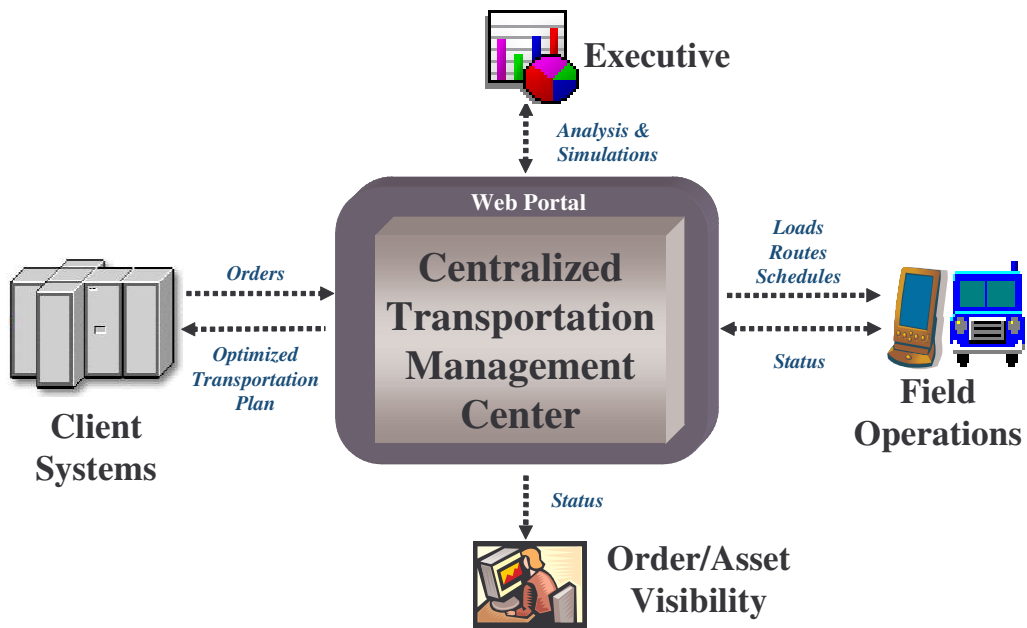
Evaluating Fleet Optimization Solutions: A Net Value Perspective

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The Past: Manual Routing & Scheduling



Next Generation: Routing & Scheduling as a Managed Service

Executive Overview

Optimizing fleet operations implies minimizing the amount of assets, resources, and miles driven while still meeting customer service requirements. However, it's virtually impossible to truly optimize fleet operations using manual processes, hence the growing demand for routing and scheduling software.

The net value of a routing and scheduling solution is the ratio of the benefits achieved versus the total cost of obtaining those benefits.

As with other investments, companies must balance the benefits of using a routing and scheduling solution with its total cost of ownership (TCO). Several factors must be considered when determining TCO, including:

- License, hardware, implementation, and maintenance fees
- Salary and benefits of users and support staff
- Training fees (initial and ongoing)
- Upgrade costs



Conventional routing and scheduling applications have enabled companies to improve their operations. However, these applications are still leaving money on the table by utilizing optimization algorithms that evaluate a relatively small set of possible solutions. Next-generation applications that employ integer programming and parallel computing evaluate a much larger set of solutions, thus increasing the probability for identifying the true optimum solution.

Companies must also evaluate the features and functions that each solution provides, with particular emphasis on the software's ability to appropriately model the constraints and business rules of your operation, which enables you to automate processes and operate more efficiently.

This report will highlight some of the factors that companies must consider when evaluating routing and scheduling software and the various deployment options available. A couple of case studies are also included to help illustrate the concepts discussed in the report.

A Choice of Deployment Options

Routing and Scheduling software has been available for many years, from vendors such as CAPS Logistics, Descartes, Manugistics, and UPS Logistics. Until recently, companies have had a single option for deploying these applications: license the technology, buy the necessary hardware, set-up the solution, and train employees to use it. A company with multiple facilities would have to repeat this process for each planning location. Not surprising, the cost and effort of this approach has been prohibitive for many companies, hence the relatively low adoption rate.

 Manual	<ul style="list-style-type: none"> ◆ Inefficient; yields poorly-optimized solutions ◆ Labor intensive and costly ◆ Non-scalable
 Software	<ul style="list-style-type: none"> ◆ More efficient than manual planning but requires... <ul style="list-style-type: none"> • Capital investment • "Power Users" & IT resources
 Outsource	<ul style="list-style-type: none"> ◆ Little or no capital investment ◆ Ongoing access to technology and domain experts ◆ Enables continuous improvement

Different Options for Routing & Scheduling

Fortunately, there are other options available today. Thanks to improvements in software architecture and the introduction of Web-based user interfaces, companies can internally host the solution and provide access to all facilities from a central location. Although this approach is much more cost-effective than implementing, staffing, and managing each facility separately, it still requires an investment in people and IT infrastructure.

A relatively new approach is to outsource the technology and planning responsibilities to a managed service provider like Velant (acquired by Scientific Logistics, Inc. see: www.scientific-logistics.com). By outsourcing, companies avoid the relatively large upfront investment in software and hardware, and they can reduce or eliminate overhead costs. In a recent ARC survey of supply chain professionals, about 75 percent of the respon-

dents (from companies with over \$1 billion in revenues) would consider outsourcing their transportation technology and/or operations.

Which is the best option for your company? The answer depends on several factors, including current IT infrastructure and support capabilities; number and location of planning facilities; and availability of trained and experienced personnel.

Calculating the total cost of ownership is a good starting point because it incorporates all of the factors listed above and provides a baseline for comparing the different options.

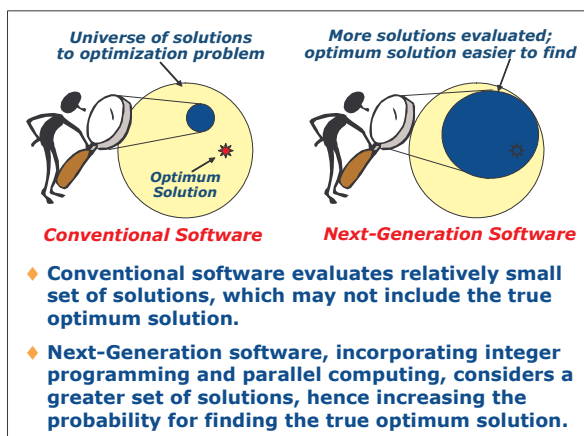
Determining Total Cost of Ownership

At first glance, it may appear that the cost of implementing a routing and scheduling solution is limited to only license, hardware, and set-up fees. But there are many other factors that directly or indirectly contribute to cost, especially when the investment is viewed as an ongoing process. The table below highlights several factors that must be considered as part of any TCO analysis.

Factor	Questions
Technology	<ul style="list-style-type: none"> • What is the upfront investment required in terms of license fees and hardware? • What is the annual maintenance cost for software, hardware, and other infrastructure components? • Do you have to purchase network data separately? What's the annual cost?
Implementation	<ul style="list-style-type: none"> • How many man-weeks will it take to go live with the solution at all facilities? What is the associated overhead cost? • How often will upgrades be performed? How long will it take? What's the associated overhead cost? • What's the cost for training, initial and ongoing?
Resources	<ul style="list-style-type: none"> • How many planners do you currently employ or need to employ? What is the overhead cost of these employees? • Is there a history of employee turnover? What is the cost to hire and train new planners? • Do you have knowledgeable IT personnel at all your locations? How responsive are they to address your needs? Do you need to hire additional IT resources? What's the associated overhead cost?
Ancillary	<ul style="list-style-type: none"> • Does the user have to manipulate the plan after it is optimized? How much time/cost is involved? • How will you standardize business processes and best practices across different locations?

The Net Value of Routing & Scheduling Solutions

While total cost of ownership is important, it has to be balanced against the benefits achieved in order to truly determine the net value of a routing and scheduling solution. In other words, value can be defined as the ratio of the



benefits achieved (e.g. cost reductions, productivity gains, etc.) versus the total cost of obtaining those benefits. Therefore, a more expensive solution from a TCO perspective may still be a better option if it generates significantly more benefits than a less expensive one.

Relative to manual routing, conventional software solutions have enabled companies to improve their operations. The benefits achieved, such as reducing the number of

routes, typically outweigh the cost of deploying the software. However, net value is often minimized or eliminated due to several factors, such as:

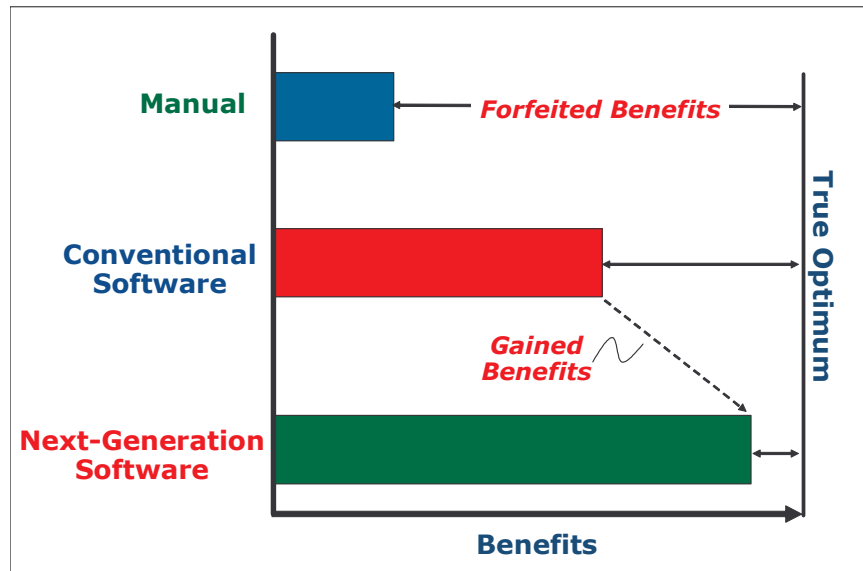
- **Employee turnover.** In general, conventional routing and scheduling solutions require “power users” that can set up, operate, and maintain the software, as well as manipulate the plan created. If this trained employee leaves the company or changes position, many companies ultimately mothball the software and revert back to manual planning, especially if significant manipulation was already taking place.
- **Poor models.** The routing and scheduling plans created by the software must be executable; hence, the software must accurately represent business processes and constraints. Unfortunately, many conventional applications are not capable of modeling complex requirements or operations, which explains why users typically have to manipulate the plan after the software creates it.
- **Limitation of algorithms.** The optimization algorithms used by most conventional applications evaluate a relatively small number of solutions and they typically leverage the computing power of only a single computer. Hence, finding the true optimum solution (which provides the greatest level of benefits) may be difficult or impossible depending on the nature of the problem.

The emergence of outsourced solutions and next-generation software applications are helping to address these issues. Outsourcing the routing and scheduling process to a service provider like Velant (acquired by Scientific Logistics, Inc. see: www.scientific-logistics.com) eliminates the need to hire, train, and retain planners and “power users” of software. In other words, companies are able to eliminate the biggest factor related to software implementation failures.

Next-generation software applications are better equipped to model complex requirements and constraints, which virtually eliminates the need to manually change the plan after it’s created. Also, these applications can quickly create and evaluate thousands of routing solutions by using integer programming and parallel computing. Therefore, the probability of finding the true optimum and achieving maximum benefit is increased.

In a benchmark study comparing the performance of a conventional routing and scheduling application with a next-generation one, the latter created a plan with 30 percent fewer routes and 32 percent fewer miles. In

short, the additional benefits gained by using a next-generation solution can be significant.



Next-Generation Software Can Provide Greater Benefits

Case Studies

ARC interviewed two companies using conventional routing and scheduling software to provide some real-life examples of TCO factors. Although the small sample size does not lend itself to statistical analysis, the data at least sheds some light on the magnitude of these costs. In order to be consistent, both companies are using similar applications from the same vendor.

Beer Distributor

A NY-based beer distributor implemented a routing and scheduling solution in mid-1999. The company manages about 200 routes per day from 4 different locations. Each facility has a planner that spends between 30 minutes and 1.5 hours creating a route plan (the time depends on the number of routes that typically originate from their facility).

Although the company wanted to create routes dynamically based on daily orders, the drivers were opposed to

Attributes	Value
Trucks Routed by Software	~ 200
Routes/Day	~ 175
# of Facilities	4
# of Planners	4
Routing Approach	Hybrid

the idea because they liked the predictability and familiarity of servicing the same routes. Hence, the company implemented a hybrid approach, whereby it created “master routes” (or pre-determined groupings of customers), but it still relies on daily orders to determine stop locations and sequences.

The cost factors associated with implementing and using the software includes:

- **\$323,577 in software, hardware, implementation, and maintenance fees.** The latter represents a recurring cost of approximately \$38,000 per year and it does not include any fees associated with hardware maintenance or upgrades.
- **\$120,000 per year in labor** (salary and overhead). This figure corresponds to 1 fully-loaded planner and 1.5 support people to update customer profiles, maintain the software, and perform IT administration activities.

Based on these factors, the first year cost of implementing and using a routing and scheduling solution was close to \$444,000. However, this figure does not include other cost elements such as:

- **Training costs.** According to the interviewee, it takes about 8 weeks to adequately train a planner. But two of the planners left shortly after being trained, so the company had to hire and train two replacements.
- **Managing IT issues.** The company does not have a sophisticated IT staff. Therefore, it experienced problems integrating the routing and scheduling software with its host system. Also, the software did not perform well on a Windows 98 platform, so it was transferred to a Windows 2000 environment. Unfortunately, Windows 2000 “caused havoc” with the rest of the company’s IT infrastructure which required time and resources to fix.

Factors	1 st Year \$443,577	Ongoing \$158,000/yr
Software, Hardware, Implementation	64%	--
Maintenance	9%	24%
Labor	27%	76%

% Breakdown of Costs

Assigning monetary values to these ancillary factors will certainly vary by company, but it’s reasonable to assume that the impact is relatively significant. And the costs are likely to be recurring, assuming future employee turnover and system upgrades.

In summary, after the first year investment of about \$444,000, this beer distributor is spending a minimum of \$158,000 per year on labor and maintenance fees to manage the routing and scheduling process in-house.

Wholesale Food Distributor

A wholesale food distributor based in the Northeast implemented a similar routing and scheduling solution in February 2002. The company has two facilities located in a single campus and manages about 100 routes per day.

This distributor has two general categories of customers: high-volume retailers and independent retailers. The former, which represent a small percentage of the overall client base, are grouped into fixed routes. Orders from independent retailers, however, are routed dynamically. The same customers tend to be grouped together due to their geographic location, but the routes change every day in order to maximize cube.

The TCO analysis for this company includes the following factors:

- **\$166,031 in software, hardware, implementation, and maintenance fees.** Maintenance is a recurring cost of approximately \$20,000 per year and it does not include any fees related to hardware maintenance or upgrades.
- **\$125,000 per year in labor** (salary and overhead). This figure corresponds to 2 fully-loaded planners and 1 support person to update customer profiles, maintain the software, and perform IT administrative activities.

Attributes	Value
Trucks Routed by Software	105
Routes/Day	~ 100
# of Facilities	2
# of Planners	2
Routing Approach	Fixed & Dynamic

Profile of Wholesale Distributor

Therefore, the cost of implementing and using the routing and scheduling solution in the first year was about \$291,000. As with the beer distributor, ancillary costs like training and resource allocation are not reflected in this figure, but these additional costs can potentially be significant.

For example, the interviewee stated that it would take about 6 months to adequately train a planner because the person would need to thoroughly understand the customer base, equipment types, and other factors that play a role in planning. Therefore, the company will be forced to take extraordinary

measures, and perhaps suffer productivity losses, if there is any turnover or prolonged absenteeism with planners.

Why the long training time? Because even with the software, planners spend about 3 hours “cleaning the plan” because it fails to take into account

Factor	1 st Year \$291,031	Ongoing \$145,000/yr
Software, Hardware, Implementation	50%	--
Maintenance	7%	14%
Labor	43%	85%

% Breakdown of Costs


certain constraints and business rules. For example, the software may assign a specific customer as the third stop in a route, but the customer always wants to be the first stop. Since the software can't factor in this rule in the optimization engine, the planner has to manually adjust the routes to make sure that all customer requirements are met.

This practice impacts cost in a couple of ways. First, the planner is forced to spend time reworking the plan instead of focusing his efforts on more value-added activities. Secondly, it's unlikely that a truly optimized plan can be achieved if human intervention is involved, especially if there are many constraints to consider.

In other words, money is being left on the table. The exact amount is difficult to calculate based on the information available, but it undoubtedly has a negative impact from a total cost of ownership perspective.

The Managed Services Approach

As the case studies illustrate, a successful routing and scheduling operation requires an investment in people and technology. Turnover, poor training, and other factors have forced many companies to underutilize their routing and scheduling software or abandon it all together. The relatively high up-front cost associated with license fees, implementation services, and training has also been an inhibiting factor, along with the ongoing costs of maintaining the solution and operation.



- ◆ **Next-generation software & IT infrastructure**
 - Integer programming
 - Parallel computing
 - Tunable solvers
 - Automated execution
- ◆ **Domain experts**
 - Maintain optimization engines and business models
 - Drive continuous improvement

People + Technology = Powerful Combination

In addition, companies have become disenchanted with the traditional customer-vendor relationship, whereby the software vendor essentially disappears after the implementation is completed. In other words, software vendors

have done a relatively poor job of making sure customers are using the software to its fullest potential, and they have not helped customers validate the return-on-investment (ROI) that was promised upfront.

In response to these factors, companies like Velant (acquired by Scientific Logistics, Inc. see: www.scientific-logistics.com) are offering fleet operators a new deployment option, namely the ability to outsource the technology and domain expertise to a third party. In many cases, outsourcing is the best approach from a cost and time-to-benefit perspective.


However, the outsourced model requires both parties to develop a strategic relationship because they truly depend on each other for ongoing success. While there's certainly risk involved with this approach, the rewards can also be greater. It's in the best interest of the service provider to ensure the solution is meeting customer expectations because the provider's ongoing revenue is directly linked to customer satisfaction. Hence, the ROI promises made by the service provider tend to be more realistic and attainable than the promises historically made by traditional software vendors.

The decision to outsource is best summarized by Mike Walsh, President of LifeGas, a medical gas supplier and a Velant customer: "In searching for a new approach, we found that most companies are frustrated by the limitations of manual planning, as we have been, but have found packaged software too difficult to use in the field. We were looking for best practices and were not willing to compromise our goals by settling for a conventional solution."

Summary & Recommendations

Companies can no longer rely on manual processes to route and schedule their truck fleets. While the cost and effort may have been prohibitive in the past, improvements in technology and new deployment options have

eliminated many of these barriers. As with other investments, companies must balance the benefits of using a routing and scheduling solution with its total cost of ownership (TCO). The benefits achieved are highly-dependent on the software's approach to optimization and its ability to appropriately



- ◆ **Automate planning process**
- ◆ **Calculate TCO of different options**
 - Upfront costs vs. ongoing costs
- ◆ **Evaluate capabilities of software**
 - Approach to optimization
 - Ability to model business requirements and constraints
 - Flexible & scalable
- ◆ **Consider outsourcing as a deployment option**
 - Domain expertise of provider
 - Satisfied customers

model your business rules and constraints. Finally, outsourcing is the best option for many companies when viewed from a cost and time-to-benefit perspective.

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Acronym Reference: For a complete list of industry acronyms, refer to our web page at www.arcweb.com/Community/terms/terms.htm

AI	Artificial Intelligence	ERP	Enterprise Resource Planning
ANSI	American National Standards Institute	HMI	Human Machine Interface
API	Application Program Interface	IT	Information Technology
APS	Advanced Planning & Scheduling	LAN	Local Area Network
B2B	Business-to-Business	MIS	Management Information System
BPR	Business Process Reengineering	MRP	Materials Resource Planning
CAGR	Compound Annual Growth Rate	MSPC	Multivariate Statistical Process Control
CAN	Controller Area Network	OLE	Object Linking & Embedding
CMM	Collaborative Manufacturing Management	OPC	OLE for Process Control
CNC	Computer Numeric Control	PAS	Process Automation System
CPG	Consumer Packaged Goods	PLC	Programmable Logic Controller
CPM	Collaborative Production Management	ROA	Return on Assets
CRM	Customer Relationship Management	ROI	Return on Investment
EAI	Enterprise Application Integration	SCE	Supply Chain Execution
EAM	Enterprise Asset Management	TMS	Transportation Management System
		WAH	Web Application Hosting
		WMS	Warehouse Management System

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