Finding the Yellow Brick Road: Part 7, I Finally Have a Brain!

WARREN B. POWELL

Department of Civil Engineering
and Operations Research
Princeton University
Princeton, New Jersey 08544

DONALD E. MAYORAS

Mau Trucking, Incorporated
90 Jacobs Addition
Ida Grove, Iowa 51445

Sometimes, there is more truth in fiction than in publicly available accounts. This story by Warren B. Powell, a leading researcher of real-time routing and scheduling models and frequent consultant to the motor carrier industry, and Donald E. Mayoras, a senior transportation executive and president of a trucking company, provides a view into the discussions many carriers undertake prior to adopting an optimization model. The account is too long to appear as a single article and instead is being published in serial form. This is the seventh installment.

The cast: Dan Manning, President; Tom Gorman, Chief financial officer; Matt Peterson, Vice president of operations; Ken Richards, Vice president of sales; Bill Johnson, Vice president of management information systems; John Breswick, Director, driver management; Michelle Corwin, Director, customer service; Larry Michaels, Director, driver dispatch; Mike Norris, Regional sales representative; Albert Lindner, Regional sales representative; Frank Townsend, Regional sales representative; Walter McCormick, Consultant; and Richard Merrick, Lead consultant, Precision Decision Systems.

Richard Merrick has just outlined the process that Precision Decision Systems uses to implement advanced optimization models. The process recognizes the limitations of data and increases the sophistication of the model as the company's data improves. The conversation now turns to defining an objective function, requiring the managers to think about what it really means to run a trucking company. As they combine their insights and experiences, everyone senses that they are starting to create an intelligent system that will help them run their company.

As Rich Merrick looked over the room for more questions, Dan spoke up. "Rich, as we move toward optimizing the company, just what is it that the model optimizes?"

"That's a good question. Part of the beauty of optimization models is that you can set the objectives. What we optimize is up to you. Part of this meeting is to decide what the objectives are."

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"Good. First is customer service. I want each load picked up on time. No service failures. Second, driver management. We are turning down freight because we don't have enough drivers. And third, deadhead miles. I want to get our loaded ratio up." Dan looked around the room for confirmation. There was no disagreement.

What we optimize is up to you.

"And equipment utilization," offered Tom. He was hoping to cut capital expenditures by getting more miles out of his tractors. Dan nodded in agreement.

Rich wrote down each point as Dan was speaking. "Good. Now, let's talk about how to prioritize. Let's take an example. You have a driver inbound to a warehouse that is 25 miles from a shipper. But the driver isn't scheduled to arrive until the afternoon, and the shipper has requested a morning pickup. What do you do?"

"Keep the shipper happy. Find another driver." Dan responded quickly.

"OK, let's create another driver. There is a driver who can handle the load now, but she's 50 miles away. Now what do you do?"

Dan thought a moment. "I think I'd take the second driver. It's more important to meet the appointment."

"Fine. You have just helped quantify a trade-off between customer service and distance. Now let's assume that this second driver was right on top of another load, and the next closest driver to that load is 40 miles away. Now you are driving this driver 50 miles to pick up the first load and then moving a third driver an extra 40 miles to cover the load the second one was going to handle. Subtracting off the 25 miles the first driver would have to go to cover the load late, you've got an extra 65 miles to meet this service commitment."

Matt jumped in. "We wouldn't do it," he said flatly. "We're evaluated on loaded ratio, and the planners have to follow certain rules."

Dan looked at Matt in surprise. Michelle, the customer service director, pitched in as well. "Chances are, we would call the customer. The morning service commitment may not be firm. The customer service reps probably entered the morning time window because the shipper wanted to get the trailer out of his lot. He doesn't close until 5:00 pm. If we ask, he probably wouldn't mind if we come in early afternoon."

John spoke up, "Wait a minute. You're ignoring the driver here. I always thought the first thing the planners did was check which drivers want to get home. You have to look at each of these drivers and check their needs. Maybe that first driver has to get back home to Houston. He might not want any of these loads."

"That's right," Matt added. "The first thing we do in setting assignments is to check for hot loads and make sure they are covered. The second thing we do is check for driver requests and try to satisfy those. Then, it's just a matter of minimizing deadhead, meeting service commitments, balancing trailer pools, and watching maintenance on the tractors."

"Sounds easy," offered Dan, bringing a few smiles.

Richard had been standing back, because he knew that discussions like this rarely took place. With the break in the discussion, he came forward.

It can't work without the full cooperation of the operations staff.

"Keep in mind, at first, the main problem is data, data, data. Also, data comes in two forms. Basic data, like driver hours, equipment types, and pickup appointments. The second form is the business processes."

"What do you mean?" Bill spoke for everyone.

"For example, you have to make a quick pickup. The load has a lot of time before delivery. And you don't have any drivers nearby. What do you do?"

"If it's near a yard, we run a local driver out to pick it up and bring it back to the yard," explained Matt.

"Are these shuttle drivers in your system?"

"No, they're just hourly locals. We don't count them in the driver pool. They also help around the yard, hostling trailers, checking maintenance, and other stuff."

"That's an example of something your dispatchers know, but the computer doesn't," Rich explained. "We can put that into the computer, but only if you tell us. In this industry, we call that head knowledge. One of the biggest challenges in implementing a model is transferring head knowledge to the computer."

"So we have to ask the dispatchers what they do?" offered Bill.

"It's not that easy. Basically, they don't know what they do."

"So how do we find out?"

Rich went on, "Dispatchers and planners don't know what they do. But they know when a decision looks wrong. What you have to do is let them look at individual decisions, identify the ones they don't like, and ask why."

"That seems simple enough," said Matt.

"Well, not that simple. Right now, the planners base decisions on criteria that they would have a hard time explaining. If we start optimizing on criteria different from those they use now, we won't know if the answers look different because we don't understand the problem or because we have changed the criteria."

"What are you telling us?" demanded Dan.

"Just that in the beginning, you have to build a system that the planners are comfortable with. You can't change too many things at once. At first, the primary goal is to transfer your understanding of the company to the computer."

"So how do we have to proceed?" continued Dan.

"At first, you have to focus on building a system the planners and dispatchers understand, that behaves roughly as they do."

"But you can't program a computer to behave the way they do. They all work with different rules!" complained Dan.

"True, but you are not trying to match exactly what they would have done. You simply have to produce decisions that make sense to them, that they understand. You have to keep them accountable for the decisions they make. If they don't like a decision, you have to work with them to find out who is making the mistake.

Sometimes, you can convince them that they are wrong. But in the beginning, most of the time if they don't like the decision, it's probably the computer that is at fault. And it's probably either bad data or bad modeling of operations.

"The implication," Rich continued, "is that you have to start by keeping the dispatchers happy. After you have a system they accept, you can start changing the rules."

"But if we build a system that keeps the dispatchers happy, aren't we just hard-coding the rules they are using now? The whole point of this system is to change operations," Dan argued.

"You are not hard-coding any rules," Rich explained. "Once we have a system the dispatchers like, it is just a matter of turning a knob in the model to change the priorities. If you want to emphasize customer service, you are going to see the model recommending longer empty moves to meet this goal. If the dispatchers are comfortable with the original system and know about the change in policy, then they will accept the new recommendations. If they're not comfortable with the original system, then they will just reject the new decisions, and your change in policy will not have any effect. Remember the model is an enabling technology, but if you want to change the way the organization behaves, you still have to change the way people operate. That takes time and confidence."

Matt was sitting quietly but inside he was grinning to himself. Everyone likes to beat on operations, but with a tool like this, people were going to learn how complicated operations really were.

Rich looked at Dan and continued, "Look at it another way. Let's assume we put this model in, and the planners don't like it. I guarantee you that they are going to be able to cite examples where the model is clearly wrong. You are faced with two choices. Get rid of the model or get rid of your planners. It doesn't take a rocket scientist to realize that you are going to decide that the model just doesn't work, because it can't work without the full cooperation and participation of the operations staff."

Dan stared thoughtfully at the wall. The strategy made sense. And he was deeply committed to getting the staff's full cooperation.

"Rich, you're right and I agree. Let's do it your way."

Everyone broke into smiles. After a few more questions, Bill closed the meeting and set up meetings between the company MIS people and the PDS programmers.

Prologue

Over the next three weeks, Bill's MIS group collaborated with a programmer from Precision Decision Systems, working out data requirements and transaction protocols. Most of the information the model needed was in the computer, although Bill realized they had to do some work to step up data quality.

Four weeks after the project-kickoff meeting, the system went into initial implementation. With the assistance of a single PDS employee, Bill's staff was able to identify and fix most of the initial data problems. New fields were required in two screens, and both the driver dispatchers and the customer-service reps had to get accustomed to some new procedures.

After three more weeks, the recommendations had reached an 80 percent acceptance level. In the last week, PDS started adjusting the model to make it smarter and smarter. In a few instances, this created some recommendations that took some explanation. Sometimes, the dispatchers went with the model. Other times, they simply entered what their own intuition told them, ignoring the model. In hindsight, they usually found it puzzling to figure out which would have been the right decision.

Matt took over management of the project from Bill and started implementing the forecasting stages. Bill developed a new screen to allow the customer-service reps to maintain lists of routine loads that their big customers regularly booked. He then communicated these loads to the model before they were booked. Ken Richards found that this process made the planners more conscious of the freight that was booked every day. It also helped the customer-service reps, since the screen cut down their work when the big customers called in. The planners found that the extra information helped improve the model recommendations.

Matt, Michelle, and Larry reorganized the functions of planning, customer service, and driver dispatch after they found that people just weren't as busy. They gave customer service more responsibility for planning, using the model's ability to plan driver assignments, even while employees were on the phone. They reassigned some of the planners to guide telemarketing efforts. The impact on the mood in the department was tremendous. Released from the monotony of daily operations, the better planners started to focus on such global issues as network balance and profitability. The customer-service reps found that they could better serve their good customers because the model would tell them right away if a driver could cover a load. This allowed them to be more selective with the smaller shippers.

After three months, Tom put together numbers to show the overall performance of the model: slightly lower empties and a substantial reduction in service failures. This was unexpected, since they had not made a decision to focus on service, instead following the guidelines of Richard Merrick to focus on usage. The model seemed to do a better job of tracking all the loads and of highlighting when an assignment took a driver off another load. The numbers also showed a reduction in drivers returned home after their due date, but it was hard to see any benefits in driver turnover. Just the same, John Breswick pounced on the statistic to use in advertising for new drivers. Equipment utilization was up but then again so was business, so it was hard to determine the cause of this change.

Dan noticed a change in the atmosphere in the company. Morale seemed to be higher, and people seemed to be adopting a more aggressive, risk-taking attitude. They had hired several new people who seemed really sharp. He wasn't sure, but he thought that the optimization project might have helped convince them to come aboard. In any case, other groups in the company had noticed the dispatch project, and this had sparked a flurry of new initiatives.

The only fly in the ointment was that overall corporate profitability continued to stagnate, reflecting competitive pressures on price. Tom was especially frustrated, since he needed the cash flow to finance equipment purchases and other initiatives within the company. Driver and equipment productivity were up, but they did not seem to be holding the line on rates, despite the company's continued growth. It seemed that sales could give away revenue 10 times faster than operations could make it up in costs.