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The Moneyball Method of Field Service Management

Using Predictive Analytics to Improve Field Efficiency

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Introduction

In the early 2000s, two vastly different businesses—baseball and field service management—began to use advanced statistical analysis to gain an advantage over their competitors. They both revolutionized their respective fields by using statistical knowledge to improve performance. The new approach replaced old models and methods and attained shockingly good results as both set new standards for their respective industries.

In this white paper, you will learn the general concepts behind predictive analytics and how they can be applied to a field service organization. The paper will cover the basic metrics that should be tracked, the use of performance pattern profiles, and how these principles can predict future events.

Major League Baseball and Sabermetrics

Moneyball: The Art of Winning an Unfair Game was a best-selling book by Michael Lewis, published in 2003. To write it, Lewis shadowed the Oakland Athletics Major League Baseball team. The book was also the basis for the acclaimed 2011 film of the same name starring Brad Pitt.

Movie fame aside, the book was a best seller on its own merits. But why was it so popular? It wasn't a typical sports book. Few famous players were featured, and it wasn't about a team in a large-market city. It was about the low-budget, small-market Athletics and their iconoclastic general manager, Billy Beane.

In 2002, the Oakland Athletics had a problem. They found themselves competing, as *Moneyball*'s subtitle put it, in an unfair game. Oakland was a "poor" team, with a payroll of US$40 million per year. The New York Yankees, another American League team, boasted a payroll of US$126 million, which made for rough competition. The Yankees could buy the best players on the market. The disparity was so extreme that Beane, a former major league player, knew he needed to search for something to level the field. He found it in the form of *sabermetrics*, a type of statistical analytics.

Sabermetrics showed that many baseball metrics were more complicated and individualized than previously thought. For example, if a batter had a high batting average of around .300, a traditional baseball manager would assume that player should be a starter whenever possible. The average, in and of itself, became the important metric. Sabermetrics, on the other hand, maintained that a player's worth came down to how he contributed to wins, not just his raw, individual statistical numbers. Results—often expressed in the form of a player's on-base-plus-slugging (OPS) average—were the key metric. What mattered was the player's ability to get on base—even by being walked—and his ability to hit for power. Sabermetrics acknowledged that batting averages alone meant little if a batter didn't score runs.

With sabermetrics, virtually anything that affects the outcome of a given baseball game matters. The logic behind sabermetrics states that if the manager understands patterns and tendencies, no matter how obscure, that manager may better optimize the players on the team, as well as predict the outcome of a given baseball situation.

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What Baseball and Field Service Management Have in Common

Before *Moneyball*, those who worked in baseball often had a simplistic view that was typified in a classic line in another baseball movie, *Bull Durham*: “This is a very simple game. You throw the ball, you catch the ball, you hit the ball.” The field service corollary to the above simplistic axiom about baseball might be, “You schedule the job, you go to the job, you do the job.”

Just as sabermetrics showed that there were tens of thousands of elements that factored into the throwing, catching, and hitting skill set, predictive analytics has proved a similar dynamic when used with field technicians. However, applying these complex principles does not require an army of statisticians. Instead, it simply requires a different—and unique—method of how to manage field service.

Focusing on Optimization

The performance of a field service organization represents one of the most mission-critical elements of any organization. The team is responsible for installing or commissioning new equipment, performing inspections and preventive maintenance, and repairing damaged or faulty assets. Furthermore, field service teams must perform these tasks against strict service-level agreements laced with penalties, or face the risk of irate customers turning to social media to voice their complaints.

As a result, managing an effective field service organization often represents a tremendous overhead for a company. Ensuring that the organization runs as efficiently as possible requires a zealous focus on the balance between worker productivity and customer commitments. Striking this balance requires a specialized style of optimization based on measuring time.

What to Measure: The Time-Based Approach

Regardless of a company’s good intentions and commitment to its customers, worker productivity still relies on one common variable—time.

If a company guarantees a 24-hour, onsite response time for a faulty piece of equipment or promises an appointment slot to a consumer waiting at home, there is a tipping point caused by lateness that can damage or break a customer’s commitment and loyalty. Conversely, there are highly skilled professionals who work on predetermined shifts. When those shifts are over, the techs are not available to solve customer problems.

Taking into consideration that time is the only common denominator among customers and field service providers, regardless of industry or geography, then time must become the foundation for all efforts to optimize the workforce.

Why Averages Will Not Work: The Importance of Measuring the Individual

Traditional techniques of field service optimization involved building schedules against workforce-optimized averages. Analysis would be performed in the field to determine how long it would take to perform a simple task. This analysis would often be focused on repeatable and consistent tasks such as product installations or routine preventive maintenance. For example, with periodic and often costly field studies, an organization may determine that one particular inspection on a piece of equipment would take approximately one hour.

Based on this information, whenever the field worker was scheduled to perform this type of maintenance, he or she would have been allotted one hour to perform the task. However, this is a fundamentally flawed approach to scheduling, as it assumes that everyone in the field force is equal.

Expanding on the example, let's say we have two different field technicians. Technician A is new to the organization and just finished training and is still getting used to the machines and equipment. As a result, Technician A needs 90 minutes to perform the preventive maintenance check. Technician B is a five-year veteran in the organization and can perform the same check in 30 minutes. When using the one-hour average as calculated above, the schedule is off by 50 percent for both technicians. The result is a suboptimal schedule.

In order to show falsehood of the average, statistics must be tracked down to the individual field service provider. Much like the *Moneyball* method of selecting baseball players, each field technician must have, and is optimized by, his or her own summary performance.

Baseline Variables Necessary for Field Service Optimization

Variables used in creating an optimized field service schedule can be significantly altered based on industry and style of work. However, in order to establish a baseline for optimization and ultimately prediction, the following elements must be tracked.

Travel Time

Travel time from one location to another location must be recorded. When recording travel time, what constitutes a location may vary.

When servicing fixed assets such as utility infrastructure or ATM machines, the true functional location of the asset will provide the most-optimal results. When servicing individual customers or, less frequently, visiting groups of assets scattered around a specific area, setting the location as the zip code or a predetermined work zone can still lead to improvements in optimization.

Much like technicians' skills, travel time cannot be averaged across an organization because driving habits will vary dramatically by employee. It is also important to accommodate for absolute travel time, which includes not just drive time, but other time constraints associated with a trip.

Job Time

Each individual in a field force has different strengths, weaknesses, and talents. These elements are expressed by the technician as he or she performs specific tasks. One individual might have a unique ability to replace a gearbox, while another excels at calibrating new equipment.

Taking this phenomenon into consideration, it is important to track the time associated with each job, by job type. The technique is most effective when optimizing against repeatable work such as installation, the commissioning of new equipment, inspections, and preventive maintenance.

Skill Types

Tracking skill types is also important. They are different from the job type metrics discussed earlier, as they are typically fixed. Skill types include trained skills, certifications, and other parameters based on hard requirements.

Much like the requirements for each position on a baseball team—pitcher, catcher, infielder, outfielder—the combination of skills each technician has will determine what jobs he or she is assigned.

Nonworking Time

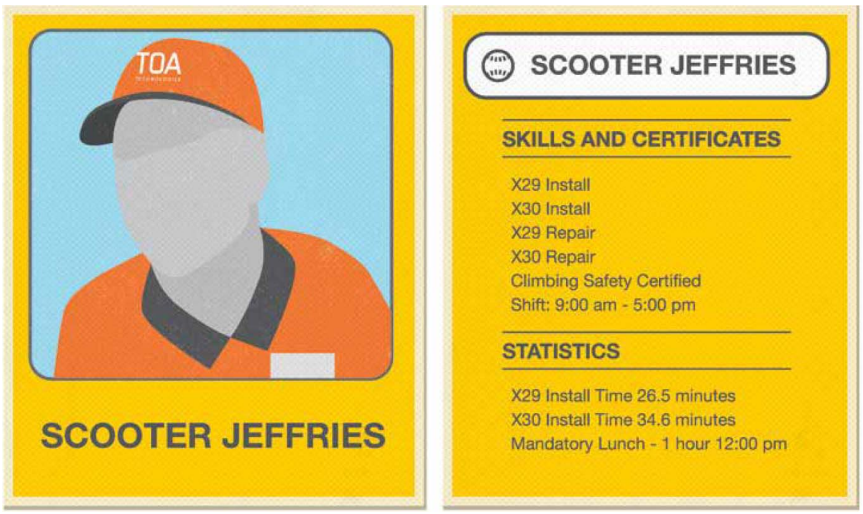
Morning meetings, mandatory breaks, lunch, trainings, and other activities all have an impact on a field service schedule and can also affect customer commitments. The good news is that these activities are typically preset for a fixed time and do not require time tracking down to the individual. However, they must be accommodated for in order to achieve an optimal schedule.

Why Online Maps are Always Wrong

Travel time appears to be one of the easiest data points to collect when scheduling. In this world of real-time traffic reports and GPS, anyone can easily calculate the travel time from point A to point B with a simple online search. However, the online map only takes into account the time actually spent driving. Other critical factors such as parking, unloading equipment, miscellaneous obstacles such as security check-in, and walk time from the vehicle to the functional location of the equipment are not included, making the projected travel time consistently understated.

Performance Pattern Profile: Building a Technician's Baseball Card

Now that you are aware of the basic elements that must be measured in the field, the next task is to piece them all together. Staying with the concept of *Moneyball*, metrics such as travel time, job time, skill types, and nonworking time allow an organization to almost literally put together a kind of baseball card on each individual in the field force.



An imaginary baseball card for a field technician would include vital statistics.

The baseball card represents the field technician's performance pattern profile. The information on this card will be used to schedule all tasks.

How Genetic Algorithms Disrupted the World of Field Service Management

Moneyball showed how using metrics helps baseball managers optimize their teams in order to win baseball games, even against tremendous financial inequities among teams. In managing field technicians, the use of *genetic algorithms* performs a similar task, but does so with even greater results.

Genetic algorithms can produce efficiencies that approach 99 percent optimization, a figure that far outruns the optimization provided by sabermetrics. The principle of optimizing each individual field technician—in view of his or her abilities, tendencies, strengths, challenges, and more—is always at play. There is no better way to optimize than by using genetic algorithms.

Genetic algorithms often work with randomly selected populations, whether that population is human or cellular in scale. In all cases, genetic algorithms provide a solution to a problem through a kind of natural selection. In this sense, *genetic* means "based on generations." This may mean generations of life forms that improve by shedding inefficient qualities. It can also be used for myriad functions, from molecular structure optimization in chemistry, to robot behavior, to field service management.

When field service software, such as Oracle Service Cloud's Field Service solution, uses genetic algorithms, the solution begins with a basic premise: "We don't know anything about you, but we'll learn." Oracle Service Cloud's Field Service solution begins by determining what things there are to count. What those things are depends on the field technician. How does the technician drive? What route does the technician prefer to take? Does she make stops? When the technician arrives at a destination, does she work quickly, so as to go to as many customers' homes as possible? Or does she like to talk with customers, and perhaps in so doing, up-sell the customer? There are unlimited possible actions, as well as an infinite variety of behaviors. These include variables pertaining to the equipment that the technician is working on, the neighborhood where she's going, the customer's history, and much more. Once it identifies the metrics to track, the software begins counting.

Conclusion

Just as *Moneyball* and sabermetrics forever changed the face of Major League Baseball, performance pattern profiles have set the standard for field service management. Every scenario is counted and calculated. The solution times an infinite variety of things, and counts every work/travel combination to build a unique work fingerprint for every field technician. This has led to the biggest shift in the history of field service management.

The genetic algorithms determine how mobile field technicians can get things done in the shortest amount of time. Mathematics, logistics, genetic algorithms, and sabermetrics aside, the word that best describes what baseball and field service have in common is *optimization*: of people, activities, and the ability to analyze and act.

Far from taking away the human element in baseball and field service management, this high level of optimization actually enables and empowers people. Optimization gives them the tools they need to be their best. It puts them in the right place, at the right time, and gives them the ability to do the job right—whether it's hitting a fastball or fixing a smart meter.

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Hardware and Software, Engineered to Work Together

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