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"Getting Started with Operations Analytics"

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As organizations mature in their use of data warehousing/business intelligence (DW/BI) solutions, many see the use of analytic applications as a logical next step. Success stories, such as credit scoring and fraud detection in the credit card industry, are well publicized and make analytic applications sound wonderful. Yet many organizations, even those that are quite sophisticated in their use of DW/BI technologies, are unsure how to proceed with analytic applications.

Analytic applications for operations, sometimes called operations analytics, can be a place to start.

What is an Analytic Application?

According to the dictionary, analytics is the science of analysis. Generally, analytics refers to analysis of data using Pareto analysis, trending, seasonality, regression, correlation, control charts, and other statistical techniques. Many DW/BI solutions provide analytic tools and techniques in their data marts.

An analytic application is a step upward in sophistication from merely providing analytic techniques or tools:

- It automates the thinking and, in most cases, a portion of the decision-making of a human being.
- It typically uses complex quantitative techniques, such as multivariate regression analysis, data mining, artificial intelligence, or nonlinear programming.

For example, an analytic application used for credit scoring might:

- Calculate a credit-worthiness score.
- Automatically accept or deny the credit application.
- Select the credit limit.
- Select which credit card product (interest rate, payment terms, etc.) to issue this applicant.

Good Candidates

Some characteristics of business problems for which an analytic application enabled by DW/BI is a good solution include:

The optimal decision is based on quantitative data, and requires sophisticated analysis of multiple inter-related variables. Problems whose solution is best determined using the skilled judgment of a human expert are not good candidates for an analytic application (unless the expert's judgment can be reduced to a set of rules for an artificial intelligence-based analytic application). Similarly, if the problem can be well solved by simple quantitative techniques (such as adding two numbers together, for example), there is no need to have an analytic application.

If the optimal decision is based on subtle statistical inter-relationships among ten or more variables, then an analytic application may be able to produce better solutions than a human decision-maker.

The problem to be solved is central to the organization.

An initiative to provide an analytic application will receive more interest and support if the problem it solves is critical to the profitability of the business, or, in the case of governmental or not-for-profit organizations, closely tied to the mission. For example, both a manufacturing company and a bank may have an analytic application for cash management. For the manufacturing company, managing cash is important in order to be able to meet payroll, pay suppliers according to payment terms, etc., but is an administrative process performed by the treasury function. For a bank, on the other hand, having the right amount of cash on hand is critical to customer service (being able to service withdrawal requests), meeting reserve requirements, and maximizing investment revenue (funds set aside to support operations are not invested and, therefore, are not earning a return). A cash management analytic application is much more central to the bank than to the manufacturing company.

Multiple, independent decision-makers remake the same decision frequently. IT systems, including analytic applications, are costly to develop and maintain. It can be difficult to justify an analytic application to automate the work of a single decision-maker who makes his or her decision once per year. Such an investment becomes easier to justify if 150 decision-makers each make a new decision every week.

An example of a good candidate for an analytic application might be restaurant-level inventory management for a chain of fast-food restaurants. Each restaurant has limited storage space for its food ingredients. Some of these materials are fresh and therefore have a short shelf life; but no restaurant wants to be unable to service customer orders because it ran out of an ingredient. If the current process is for each restaurant manager to decide twice a week what quantities of which ingredients to order from the centralized supply point, there is an opportunity to have an analytic application at headquarters take the place of independent decisions made at each restaurant.

The current decision-making process is intuitive or informal. If the multiple, independent decision-makers make their decisions based on intuition or “rules of thumb” rather than using quantitative methods (and the problem is fundamentally a quantitative rather than qualitative one), it is a good potential candidate for an analytic application.

Continuing our fast-food restaurant example, a restaurant manager may use simple rules for ordering, such as, “On Monday, I order twenty dozen buns, but on Thursday I order thirty dozen, because we’re busier on the weekend than during the week.” Such a heuristic does not take into account how much storage space is available at the restaurant, the freshness profile of the current bun inventory, or which menu items that require a bun are on promotion this week.

Decisions from the analytic application can be quantifiably better than the current decisions. If the organization

is content with the decisions made by the current decision-making process, or it is unclear how an analytic application could produce better decisions, it will be difficult to “sell” the analytic application. Cash management at a bank can yield quantifiable benefits – less money tied up in cash at the branches (thereby more available for investment), while still meeting customer service objectives for funds availability. Better inventory management of ingredients in a fast-food restaurant chain also can be quantified: fewer stock-outs, less inventory throwaway due to aging, and reduced inventory carrying cost. A less obvious way the automated solution can be better is that it makes the decision in a consistent way.

The time spent in the present decision-making process has a high opportunity cost. A universal challenge of sales forces is reducing the time the salespeople spend on administrative matters like filling out expense reports so they can spend more time calling on customers and potential customers. A ubiquitous challenge for executives is how to spend more time on strategic issues. An analytic application can deliver value by automatically making routine decisions, thereby freeing up the time of key individuals for other activities.

A business problem does not have to meet all of these criteria in order to be a good candidate for an analytic application. For example, an analytic application that automatically makes a routine decision that is currently made frequently by multiple decision-makers can be a good choice, even if the problem is not central to the organization and does not require sophisticated quantitative methods.

Operations Analytics

The locus of decision-making in operations is the front-line manager. While executives and/or headquarters staff set strategy, actual performance results from tactical decisions made at the front line. This is particularly

true for service operations (banks, restaurants, chain supermarkets, some government agencies, and the like), because the front line typically is the point of contact with the customer. Therefore, one way for operations analytics to achieve maximum business benefit is to focus on providing decision-making help to the front-line operational manager.

Operations analytics can help the front-line manager in two ways. The first is by utilizing the common, integrated data provided by DW/BI and analytical techniques to make a better decision than the manager can make using informal methods or intuition. The second is by saving the manager time, thereby freeing him or her up for customer service, people management, or other activities.

Case Study

To illustrate which analytic applications might be useful for a service operation, let’s examine an operation most people would rather avoid, a Department of Motor Vehicles (DMV) office. The services a DMV office provides are related to driver’s licenses and motor vehicle registrations. It is a distributed operation (that is, there are multiple physical locations performing essentially identical work) in that each state typically has multiple DMV office locations.

Operations Challenges

A DMV office has elements typical of many service environments: a flexible workforce able to perform all of the work activities, predictable traffic patterns, and customers who would prefer not to wait at all. A primary management challenge is scheduling the available staff to meet the service needs of the walk-in customer traffic. To meet this challenge, managers at each DMV office make real-time adjustments, moving staff from administering the written tests to taking photographs and issuing licenses, in order to keep the lines mov-

ing. Another management challenge is continually to improve labor productivity because the budget situation of state governments does not allow staffing to increase proportionally with demand.

Further complicating the job of the DMV is the explosion of transactions processed on the Internet and by mail; channels provided for customer convenience and to reduce traffic to DMV offices. Historically, vehicle registrations, license renewals, and other routine transactions required an in-person visit to the local office. This single customer contact method allowed the office manager to minimize work in process and enabled customers to leave having completed their transaction. However, if a customer's Internet or mail transaction is delayed, he or she may go to the local office to determine the reason. Therefore, the availability of alternative channels (Internet and mail) has the potential to increase the in-person traffic to the DMV offices, rather than decrease it.

Information Needs

The DMV has two levels of management with distinct, yet overlapping, information needs. Local office managers need information about customer wait time, productivity, number of license plates issued, number of vision tests administered, and so on for their individual office. The state executive in charge of the entire DMV organization needs the same information, but is less concerned with immediate-term issues (How long is the wait time for service in office X right now?), and more concerned with consistency of test administration among offices, identification and promulgation of best practices, optimal allocation of available resources (primarily staff) among offices, and other network-wide issues.

With this understanding of the organization and operations of the DMV, we can examine how DW/BI and operations analytics can deliver business value to it.

Providing metrics on accuracy, service, productivity, and costs to meet the needs of both local office managers and the state DMV executive is a straightforward application of DW/BI technologies. The DMV also has business problems which operations analytics enabled by the DW/BI solution can help solve.

Staff Planning

A useful application that could be enabled by the above-described DW/BI solution is a macro-level staffing model. Such a model would consider forecasted demand for the various services provided by the DMV, the labor productivity for each service, the existing employee population by office, skill set and grade level, projected retirements and other turnover, and other factors to develop a hiring plan and/or plans to develop or redeploy the existing staff. This model typically would be executed annually as part of the annual planning and budgeting process.

Additional analytic applications using this and other data include the ability to:

- Assess the need for additional DMV offices, and determine where they should be located.
- Evaluate alternative methods of service delivery, such as self-service kiosks and mobile DMV operations (a DMV bus similar in concept to a bookmobile).
- Examine policy alternatives, such as which days and hours DMV offices should be open to the public.

These applications do help the DMV optimize operations, but they do not help the local office managers with their decision-making. For an example of that, let's look at staff scheduling.

Staff Scheduling

The macro-level staffing model used by headquarters helps determine how many employees are allocated to each office, which, from the perspective of the office manager, merely is a resource constraint. What the office manager needs is a tool to help him or her match resources to demand by scheduling when to have the employees in that office work. Staffing is the primary supply element in the demand-supply equation for a DMV office. The factors affecting this supply and demand include:

- Walk-in traffic patterns for the office throughout the day, week, month, and year.
- Wait-time and other service objectives.
- Vacation schedules.
- Laws, bargaining agreements, and DMV policy regarding employee work schedules.
- Budgetary constraints on whether and how much overtime can be worked.
- Mandatory employee training.

Much of this data is quantitative and can be provided by the DW/BI repository of application and HR data. In addition, there will always be relevant information about the local situation that is not reflected in the historical data, but which a good office manager will know. For example, a new Wal-Mart store down the street has its grand opening Thursday of next week, and the increased traffic to the neighborhood on that day may bring more people into the DMV office, requiring more staffing. The best approach to staff scheduling for the DMV (and similar service operations) is a scheduling workbench that combines the computational power of the analytic application with the local knowledge of

the office manager. The analytic application suggests a solution to the manager based on the quantitative data, which the manager refines, if necessary, perhaps using simulation.

The benefits of this analytic application are to:

- Help meet service objectives, particularly for wait time, with the least staffing and therefore the lowest cost.
- Minimize the time office managers spend doing staff scheduling.

Inventory Management

Each DMV office has an inventory of blank driver's license and vehicle registration forms, license plates, and registration stickers to affix to license plates. Management of this inventory is important because, on the one hand, the office doesn't want to run out of any of these items; on the other hand, high inventory increases the risk of theft and fraud. The traditional approach to this inventory management problem is for the manager of each office to track his or her inventory (perhaps even manually) and decide when, what items, and how many of each to order from the central supply. However, because the usage of each material (that is, its issuance to driver's license and vehicle registration applicants) is captured by the application processing systems, an analytic application can be developed to manage the material inventory and automatically replenish each office as needed.

Such an analytic application would:

- Remove a routine administrative function from the local office managers, freeing them up to spend more time on other matters.

- Give DMV headquarters more ability to control the amount of inventory in the network of offices.
- Provide a mechanism to detect theft, fraud, or misuse by comparing the historical usage (issuances) by each office to the quantities replenished.

Analytic applications combine DW/BI technologies with quantitative techniques to automate part or all of a decision-making process. Success with these applications begins with selection of the right business problems to solve with them. Characteristics of such problems include a solution based on complex quantitative analysis of data provided by DW/BI, centrality to the organization, multiple, independent decisions remade frequently, an intuitive current decision-making process, opportunity to make demonstrably better decisions, and decision-makers whose time has high-value alternative uses.

As our case study of the DMV shows, operations has business problems which have these characteristics, and therefore operations analytics—analytic applications for the operations function—can be a good place to begin for organizations looking to leverage their investment in DW/BI.

About the Author

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About DecisionPath Consulting

DecisionPath Consulting provides strategy, business process, technology and program management services in the specialized field of Business Intelligence (BI). When properly implemented, BI processes provide the accurate, highly relevant and timely information that's required to optimize financial and operational performance in any organization. DecisionPath Consulting is an independent, objective source of business and technology expertise required to ensure that your BI initiative is successfully deployed in a timely, cost-effective manner.

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