Advanced Analytics

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INTRODUCTION

In the previous sections of this series we introduced the closed-loop model — and its relationship to business analytics — and the individual software components that support this model. In section 1, we also introduced the existence of a "learning gap" that stems from the disconnect between traditional business intelligence–based decision support processes and advanced analytics that support forecasting, optimization, and scenario planning processes.

In this section, we'll delve deeper into the model step of the closed-loop model and look at the advanced analytic tools that support it. As opposed to traditional business intelligence tools that help in answering the question, what happened, advanced analytics allow users to answer the question, what will happen? By showing the impact of alternative courses of action, advanced analytics can lead to the making of decisions that will yield the highest expected return.

TRADITIONAL BUSINESS INTELLIGENCE VERSUS ADVANCED ANALYTICS

Today, traditional BI software such as query, reporting, and multidimensional analysis tools are becoming more commonly used. Advanced analytics tools supporting mathematically based modeling activities such as forecasting, optimization, and scenario modeling are less commonly found in business analytics solutions. If advanced analytics can be applied to optimize operational decisions for specific business processes (such as inventory management or marketing or production), there can be a significant competitive advantage for an organization.

What are the potential advantages to an organization of deploying advanced analytics over and above traditional business intelligence tools? Consider the closed-loop model shown in Figure 1. Traditional business intelligence tools enable organizations to track performance of business operations (i.e., the track step), answering questions about the performance of suppliers or the trends in product sales. Anomalies or exceptions in these results can be explored according to business dimensions such as region, channel, or product (i.e., the analyze step). The results of this analysis can be published and made available to managers and knowledge workers throughout an organization as a type of report card on business performance.
But such feedback on past performance is only a start. Other questions follow.

What course of action can be taken to reverse a negative trend or accelerate a positive one? Among several courses of action, what is the probable impact of each? These questions are not addressed by the *track* and *analyze* steps. This is the "learning gap" between the reporting/analysis of information about past performance and the modeling of future alternatives combined with the guidance in making specific decisions.

While the *analyze* step of the closed-loop model answers the question, what happened and why, the *model* step addresses the question, what will happen? Examples include:

- What will be the impact of a price change?
- How does a recent customer activity trend predict future behavior or customer attrition rates?
- How does a certain pattern in product quality data predict future servicing costs?
These questions imply specific decisions requiring quantitative evaluation and probabilistic analysis. These and other similar questions can be addressed in the modeling step with advanced analytics tools. BI tools and advanced analytics clearly target different end-user groups and address different user needs. However, the two steps are closely linked.

THE LINK BETWEEN BUSINESS INTELLIGENCE AND ADVANCED ANALYTICS

While the closed-loop model presents analyze and model steps as sequential, they are in fact highly interdependent and cross-referential. In some cases, data is first explored with basic BI tools, then subsets or points of additional interest are further analyzed using advanced analytics. In other cases, data is first analyzed with advanced analytics tools and the results of such analysis are then delivered to either information consumers or to business analysts for further exploratory analysis with traditional BI tools. While there is no one sequence of tasks that can be considered superior to others, a business analytics architecture should be able to support all the potential analytic needs and processes of an organization.

FROM MODELING TO DECISION MAKING VIA THE POLICY HUB

The model phase in a closed-loop system is where alternative responses or adjustments to business policies or rules are considered. Modeling encompasses various advanced analytics techniques such as scenario planning, forecasting, what-if analysis, simulation, and optimization. These processes are carried out using statistical and mathematical techniques that vary depending on the type of data and process being analyzed.

To be clear, modeling does not mean accurately predicting the future. The most important aspect of modeling is a quantitative approach to dealing with future uncertainty. By assigning probability to future possible events, organizations can create plans to deal with scenarios including new competitive threats, shifts in customer preferences, or price wars.

But analytic intelligence goes beyond modeling. The model step leads to the policy hub — the stage at which decisions are made. The results of the modeling work are considered, along with business judgment, to decide on changes or adjustments to business policies or rules. We learn from the analysis of trends and the causal relationships we have observed in the past as aids to enable us to positively impact the future by adjusting business policies or rules. The probable impact of various scenarios, developed in the model phase, provides guidance on the optimal choices that could be made by decision makers.

The policy hub is the critical link between analytics and operations. Revisions to current policies must be forwarded to the relevant operational systems where specific adjustments are made (e.g., pricing changes) that will govern future operations where business is transacted (adjust/act). There may be several transactional systems that must be adjusted, hence the need for a hub to translate the policy or rule into the forms needed by each system. The results from multiple systems are monitored ("track") and analyzed as the cycle continues.
FROM DECISION SUPPORT TO DECISION PROCESS AUTOMATION

The goal of all organizations is to gain maximum insight by traversing the stages of the closed-loop model as fast as possible, utilizing the most appropriate software tools at each stage and relying on accurate data. In certain situations where trends change frequently, the links from modeling to decision making to actions may be fully automated. An example is the recommendation of certain products to an online customer who has signed in to a Web store. In this case, the action or recommendation is instant and based on previously developed rules, which themselves were developed based on analysis of customers' buying patterns.

Advanced analytics tools, the core of modeling, will become more relevant in an organization's daily operations as the opportunity to embed such tools into analytic applications increases. Such embedding opens decision impact evaluation to broader audiences. It is a rare individual who understands the business problem, is skilled in advanced analytical techniques, and knows how to apply the appropriate technique to the problem at hand. Instead of just looking at the results of a report and then trying to come up with a decision based on past experience, decision makers will increasingly be able to instantly evaluate the probable consequences of their decisions, the impact their decisions will have on the bottom line, and take actions based on the level of risk they are willing to tolerate.

Embedding advanced analytics within an application helps drive consistency in the way a specific type of operational decision is made by different knowledge workers within an organization. Defining a process within an application used to mean prescribing an unvarying way in which operations are done. Defining a broader process that includes monitoring of feedback, modeling, and adjustment is the way to achieve both efficiency and optimization. The closed-loop cycle of feedback and correction is the hallmark of an adaptive organization and is the key to true competitive advantage.

OPTIMIZATION VERSUS FLEXIBILITY

Most of the attention on transactional enterprise applications such as ERP, CRM, and SCM has been focused on driving optimization into clearly defined and repeatable processes. Automation has been the primary value proposition of such applications. However, singular focus on optimization neglects to take into account the value of flexibility.

Adaptive organizations that are able to successfully navigate through good and bad economic times have adopted the closed-loop model and extended the operational process to incorporate both transactional and analytic features. In these organizations, advanced analytics help strike a balance between optimization and flexibility.

Forward-looking analytic processes that allow organizations to anticipate either adverse events or new opportunities are able to react faster than their competitors to changing market conditions. While traditional BI tools help in gaining insight into historical trends, advanced analytics "analyze the future."
THE ARCHITECTURE FOR BUSINESS ANALYTICS

This article on advanced analytics concludes a series that introduced the closed-loop model — and its relationship to business analytics — and the software components that support this model. When planning a new business analytics initiative or reevaluating existing analytic processes and software, organizations should consider that the individual components of data integration, data warehouse generation and management, business intelligence tools, and advanced analytics are all interlinked building blocks of a single architecture.

The goal should be to develop a unified foundational layer utilizing ETL, data quality, and data warehouse management tools linked together through common metadata. A unified foundation enables a consistent enterprise view of all the relevant data for all users ranging from executives, analysts, and application developers to information consumers, suppliers, and customers. Business intelligence and advanced analytics tools or prepackaged analytic applications should then be deployed on this unified foundation. A clear understanding of different end-user groups within and outside of the organization should act as a guide to what tools and functionality are made available to the end user.

The result will be an adaptive organization that merges its analytic and transactional resources to gain competitive advantage through highly optimized yet flexible processes.

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