From business insight to business action

Combining the power of IBM Predictive Analytics and IBM Decision Optimization

IBM

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Executive summary

Businesses today certainly do not suffer from a lack of data. Every day, they capture and consume massive amounts of information that they use to make strategic and tactical decisions. Yet organizations often lack two critical capabilities when it comes to making the right decisions for the business: the ability to make accurate predictions about the future, and to then use those predicted insights in conjunction with organizational goals to identify the best possible actions they should take.

The combination of predictive analytics and decision optimization provides organizations with the ability to turn insight into action. Predictive analytics offers insights into likely scenarios by analyzing trends, patterns and relationships in data. Decision optimization prescribes best-action recommendations given an organization's business goals and business dynamics, taking into account any tradeoffs or consequences associated with those actions.

IBM® recognizes the value created by the synergy between predictive analytics and decision optimization, and is uniquely positioned to help organizations integrate predictive and prescriptive capabilities into their process for achieving optimized business decisions.

This white paper will help organizations understand how predictive and prescriptive actions complement one another and present IBM's approach to helping businesses create a powerful end-to-end decision management system.

From predictive to prescriptive

Predictive analytics and prescriptive analytics are complementary technologies that build on one another to answer critical questions and give organizations an informational advantage that can drive successful outcomes.

- Predictive modeling and analytics provide a forward-looking view by answering the question: "What is likely to happen next?"
- Prescriptive analytics builds on the predictive model by applying business rules and optimization modeling to answer the question: "What should we do about it?"

Predictive analytics

"What could happen?" Predictive analytics helps managers anticipate likely scenarios for a proactive, rather than reactive, approach to decision making. Predictive analytics, rooted in statistical techniques and mathematical models, applies advanced algorithms that process historical data, "learn" what has happened in the past and create models that can be applied to make decisions about current or future cases. By uncovering patterns, interactions and relationships hidden within data, predictive analytics delivers actionable insights on likely scenarios and future outcomes.

According to TDWI Research, the top five reasons companies should use predictive analytics are to predict trends, understand customers, improve business performance, drive strategic decision-making, and predict behavior.[1]

Prescriptive analytics

"What should we do?" Prescriptive analytics leverages mathematical optimization methods to rapidly explore every possible scenario and recommend the "best" action that meets a given business objective. Prescriptive analytics is the critical next step on the path to insight-based actions. It creates value through synergy with predictive analytics by taking the forward-looking insight to the next level and suggesting the optimal way to handle the present or future situation. Prescriptive analytics utilizes mathematical algorithms to handle situations with many alternatives, requirements and trade-offs, thereby helping organizations act fast in dynamic conditions and make superior decisions in uncertain environments to gain a strong competitive advantage.

IBM SPSS Modeler and IBM Decision Optimization

A US communications service provider breaks down data silos, helping it realize a 90 percent increase in network data capacity; gain the ability to automatically detect suspicious use patterns and shut down devices suspected of fraud; and deliver data that is more than 90 percent more current to call center agents by leveraging IBM SPSS® Modeler and IBM Decision Optimization.

Bridging the gap between insight and action

To thrive in today's complex and ever-changing environment, companies need to gain rapid insights into their business and translate those insights into actions. Recognizing this challenge, IBM offers a synergy between predictive and prescriptive analytics that enables organizations to bridge the gap between insight and action.

Traditionally, predictive analytics provides a prediction or insight into what is likely to happen and decision optimization offers a recommendation from a set of possible actions. The challenge is how to make business decisions when insights are translated into actions. The integration between IBM Predictive Analytics and IBM Prescriptive Analytics helps organizations to take data, extract insights from it, and determine what to do based on those insights.

- IBM SPSS Modeler provides a **predictive engine** for analyzing patterns that can help anticipate likely scenarios for data-driven and proactive planning.
- IBM CPLEX® Optimization Studio provides a **decision support toolkit** for development and deployment of optimization models across multiple optimization algorithms that recommend an optimal action given business rules, resource constraints and goals.

IBM takes decision making to the next level by giving organizations the tools to predict likely scenarios and integrate these insights into the prescriptive engine, so that decisions are dynamically optimized with a forward-looking view.

IBM SPSS Modeler

IBM SPSS Modeler is a powerful predictive analytics platform that is designed to bring predictive intelligence to decisions made by individuals, groups, systems and your enterprise. SPSS Modeler scales from desktop deployments to integration with operational systems to provide you with a range of advanced algorithms and techniques.

IBM SPSS Modeler can help your organization discover hidden opportunities and new insights using a variety of analytical methods to access data sources, such as data warehouses, databases, Hadoop distributions or flat files, which can reveal previously unseen patterns in your data. SPSS Modeling includes an array of modeling techniques, such as classification, segmentation, association, time series and forecasting, extendibility with R Programming and Monte Carlo simulations. Additional features include text and entity analytics, social network analysis, geospatial analytics and automated data modeling.

The intuitive SPSS Modeler interface uses drag-and-drop functionality that allows analysts to create complex models quickly and intuitively (see figure 1).
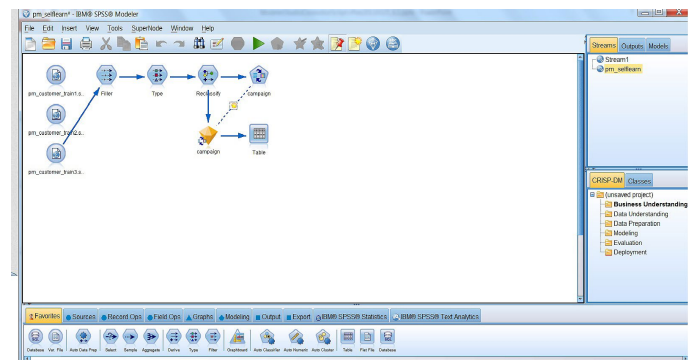

Figure 1: In this sample model stream, SPSS Modeler is used to predict which marketing offers will be most effective for a particular campaign.

IBM SPSS Predictive Analytics and IBM Decision Optimization

A large passenger and cargo railway company in Switzerland predicts the optimal prices and schedules for ticket promotions as they relate to the entire campaign portfolio, thereby increasing yearly revenues by approximately USD1.5 million, leveraging IBM SPSS Predictive Analytics and IBM Decision Optimization.

IBM CPLEX Optimization Studio

There is no question that today, companies need to go beyond business intelligence. They need a map that gives them a clear understanding of the impacts, trade-offs and likely outcomes of their choices and decisions. Mathematical optimization can help decision makers anticipate best-case, expected-case and worst-case scenarios; understand trade-offs, alternatives, bottlenecks and inconsistencies; and develop plans and schedules that can be adapted in the course of operations.

IBM CPLEX Optimization Studio software provides powerful advanced analytics to transform data and predictive solutions into optimized prescriptive courses of action—replacing intuition and heuristic thinking with fact-based decisions. IBM CPLEX Optimization Studio solves complex business planning, scheduling, pricing, inventory, and a multitude of other operational problems that are beyond the capabilities of the human brain or

modern spreadsheets. Software providers in many industries rely on IBM CPLEX Optimization Studio in their mission-critical applications. In fact, more than 1,300 commercial customers, including one-third of the Global 500 and researchers at more than 1,000 universities, depend on this solution for unequaled solving power, stability and flexibility.[2]

The CPLEX Optimization Studio can generate recommendations by integrating predictive models built with SPSS Modeler (see figure 2).
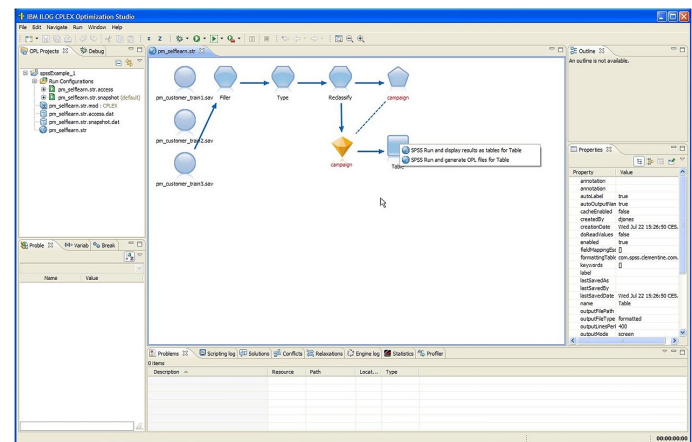

Figure 2: The predictive model introduced in Figure 1 is integrated into the CPLEX Studio environment to determine which marketing campaign to use for each customer.

```
Marketing plan has 20 offers costing 364

Selected offers =
customer 139987 => Mortgage seminar
customer 140030 => Pension seminar
customer 140089 => Savings seminar
customer 140097 =>
customer 139068 => Car loan newsletter
customer 139154 => Car loan newsletter
customer 139158 =>
customer 139169 => Car loan newsletter
customer 139220 => Car loan newsletter
customer 139261 =>
customer 139416 =>
customer 139422 => Mortgage seminar
customer 139532 => Mortgage seminar
customer 139549 => Car loan newsletter
customer 139560 => Pension seminar
customer 139577 => Car loan newsletter
customer 139580 => Car loan newsletter
customer 139636 => Car loan newsletter
customer 139647 => Car loan newsletter
customer 139649 => Car loan newsletter
customer 139665 =>
customer 139667 => Car loan newsletter
customer 139696 => Car loan newsletter
customer 139752 => Mortgage seminar
customer 139832 =>
customer 139859 => Savings seminar
customer 139881 =>
```

Figure 3: The marketing manager receives a recommended offer for each customer that takes into account the marketing budget and desired outcomes.

IBM Decision Optimization

As companies move to transform their intelligence into action, mathematical optimization is becoming a fundamental tool—an absolute must have—in all strategic and operational planning and scheduling processes. IBM Decision Optimization is at the forefront of this revolution—helping to bring Operations Research technology into the mainstream for everyday business use.

Powerful end-to-end decision management

An IBM study shows that organizations using analytics to determine why and what they need to be doing are twice as likely to outperform their industry peers.[3]

It is important for your organization to match its infrastructure, technologies and processes—its level of analytics maturity—to the stage of analytics it is able to perform and the business goals it wishes to accomplish. A recommended strategy is to begin with solutions that work with existing data to gain immediate insights while putting into place the technologies and processes to support more complex analytics.

IBM SPSS Modeler and IBM Decision Optimization

A major retailer in the United States significantly improves its inventory turns, reduces logistics costs and gains the ability to predict revenue and expenses by implementing IBM SPSS Modeler and IBM Decision Optimization.

IBM SPSS Modeler and IBM CPLEX Optimization Studio can help you achieve end-to-end decision management for dramatic results and improved return on investment (ROI):

- **Predict:** Analyze patterns that are found in historical and current transaction data and attitudinal survey data to predict potential future outcomes.
- **Optimize:** Find the optimal solution given various choices, alternatives and influences that might affect the outcome.
- **Decide:** Decide the best course of action to take given your objectives, requirements and constraints.

The synergy and integration between IBM SPSS Modeler and IBM CPLEX Optimization Studio offer a powerful way to predict, optimize and make better decisions; achieve better data management and transformation capabilities for IBM Decision Optimization users; improve operational efficiency; and automate, optimize, and govern repeatable complex business decisions.

For more information

To learn more about IBM SPSS Predictive Analytics and IBM Decision Optimization, please contact your IBM representative or IBM Business Partner, or visit the following websites: **ibm.com**/software/analytics/spss/products/modeler/ and **ibm.com**/software/products/en/ibmilogcpleoptistud/

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1 http://www.forbes.com/sites/forbesinsights/2015/01/05/why-you-should-be-using-predictive-analytics/

2 IBMILOG CPLEX Optimizer: High performance mathematical optimization engines, (June 2010)

3 Steve LaValle, Michael Hopkins, Eric Lesser, Rebecca Shockley and Nina Kruschwitz, "Analytics: The new path to value," IBM Institute of Business Value and MIT Sloan Management Review, IBM Corp., October 2010

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