DATA MINING: A SOURCE FOR CREATIVE DECISION MAKING

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ABSTRACT

In present day literature Data Mining refers to computer-aided pattern discovery of previously unknown interrelationships and recurrences across seemingly unrelated attributes in order to predict actions, behaviors and outcomes. Data mining, in fact, helps to identify patterns and relationships in the data. Most of the successful business decisions are made from reliable data source and their validation through the application of tools and technique. Statistics used as a tool for analyzing this data and produce valuable information to the decision makers. In this paper an effort has been made to show how these data mining and statistics are contributing to managerial decisions. Exploring the valuable data with data mining techniques and professing of such data by statistical software is gaining importance in today’s business community. All national and multinational companies are using various data mining techniques to explore the relationship between various micro and macro economic factors and make policies using data analytics.

INTRODUCTION

Data Mining means the extraction of hidden predictive information from large database, it is a powerful new technology and prospective for companies to focus on the most important information in their data warehouses. In present literature, data mining refers to computer-aided pattern discovery of previously unknown interrelationships and recurrences across unrelated attributes in order to predict actions, behaviors and outcomes. Data mining involves the use of sophisticated data analysis tools to discover previously unknown, valid patterns and relationships in large data sets. These tools can include statistical models, mathematical algorithms, and machine learning methods (knowledge discovery in databases).
Data mining tools predict future trends and behaviors, allowing businesses to make creative, knowledge-driven decisions. The prospective analyses offered by data mining move from past events provided by up-to-date tools. Data mining tools can answer business questions that were time consuming to resolve. They need the help of databases for hidden information that may miss because of that information may lies outside their expectation.

WHAT IS DATA MINING?

Data Mining is the process of analyzing large data sets in order to find patterns that can help to isolate key variables to build predictive models for management decision making. In essence, data mining helps businesses to optimize their processes so that their customers receive the most relevant services and the costs of serving them are proportionate to the value of the profits earned from them, a company’s exposure to risk is proportionate to premiums earned, etc. Data Mining enables companies to segment their customer base and to tailor products and services to the needs and purchasing power of individual groups of customers.

Most companies already collect and refine massive quantities of data. Data mining techniques can be implemented on existing software and hardware platforms to enhance the value of existing information resources and can be integrated with new products that are brought online. On implementation of this high performance server or parallel processing computers, data mining tools can analyze huge database to deliver answers to questions like potential customers who are ready to respond at their promotional mailing.

**Data Mining Objectives**

Two “high-level” objectives of Data mining: prediction & description

- **Prediction** of unknown or future values of selected variables
- **Description** in terms of (human-interpretable) patterns

![Data Mining Objectives](image-url)
DATA MINING IS A SOURCE FOR?

Data Mining is for executives involved in strategic and tactical decision making as well as operating managers responsible for cost reduction. Strategic Managers use data mining for competitive intelligence, identifying market opportunities, product launch decisions and product positioning. Managers responsible for tactical decision making use similar tools for sales forecasting, direct marketing, customer acquisition, retention and extension purposes and marketing campaign analysis. Finally, operational managers can use similar data for decisions such as the choice of sub-prime borrowers or supply chain management.

APPLICATION OF DATA MINING TECHNIQUES

Data mining techniques are the result of a long process of research and product development. This evolution began when business data was first stored on computers, continued with improvements in data access. Since recent time this technology is useful to companies and managers to detect the real information in time. Data mining is useful for application in the business community, because it is supported by three technologies that are now sufficiently mature:

- Massive data collection
- Powerful multiprocessor computers
- Data mining algorithms (computerized mathematical calculations)

Data mining algorithms embody techniques that have existed for at least 10 years or more but have only recently been implemented as mature, reliable, understandable tools that consistently outperform older statistical methods.

In this technological progress from business data to business information, each and every new step is been built upon old and previous one. For example, the ability to store large databases is vital to data mining. From the manager’s point of view for good decision making, the four steps listed in Table 1 were revolutionary because they allowed new business questions to be answered accurately and quickly.
### TABLE NO.1

**STEPS IN THE EVOLUTION OF DATA MINING**

<table>
<thead>
<tr>
<th>Evolutionary Step</th>
<th>Business Question</th>
<th>Enabling technology</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Collection</td>
<td>&quot;What was my total revenue in the last five years?&quot;</td>
<td>“Computers, tapes, disks”</td>
<td>Retrospective, static data delivery</td>
</tr>
<tr>
<td>(1960s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Access</td>
<td>&quot;What were unit sales in Calcutta during last March?&quot;</td>
<td>Relational data base (RDMS), Structural Query Language (SQL)</td>
<td>Retrospective, dynamic data delivery at record level</td>
</tr>
<tr>
<td>(1980s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Warehousing &amp; Decision Support</td>
<td>&quot;What were unit sales in West Bengal during last March? Drill down to Calcutta.&quot;</td>
<td>On Line Analytic processing (OLAP), Multidimensional data base, data warehouses.</td>
<td>Retrospective, dynamic data delivery at multiple levels</td>
</tr>
<tr>
<td>(1990s)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Mining</td>
<td>&quot;What’s likely to happen to Kolkotta unit sales next month? Why?&quot;</td>
<td>Advanced Algorithms, Multiprocessor computers, massive database.</td>
<td>Prospective, proactive information delivery</td>
</tr>
<tr>
<td>(Emerging Today)</td>
<td></td>
<td></td>
<td></td>
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</table>

The core components of data mining technology have been under development for decades, in research areas such as statistics, artificial intelligence, and machine learning. As the maturity of these techniques along with high-performance and broad data integration efforts, make these technologies practical for current data warehouse environments.

Data mining derives its name from the similarities between searching for valuable business information in a large database — for example, finding linked products from store scanner data — and mining a mountain for a vein of valuable one. This process requires, either sifting through an immense amount of material, or intelligently probing it to find exactly where the value...
resides. Given databases of sufficient size and quality, data mining technology can generate new business opportunities by providing these capabilities:

- **AUTOMATED PREDICTION OF TRENDS AND BEHAVIORS.** Data mining automates the process of finding predictive information in large databases. Questions that traditionally required needs analysis can now be answered directly from the data more efficiently. For example, if a problem arises to predict about targeted marketing, using data mining tools and technology could identify the past promotional mailings and the targets that most likely to maximize return on investment in future mailings. Other predictive problems include forecasting bankruptcy and other forms of default, and identifying segments of a population likely to respond similarly to given events.

- **AUTOMATED DISCOVERY OF PREVIOUSLY UNKNOWN PATTERNS.** Data mining tools sweep through databases and identify previously hidden patterns in one step. An example of pattern discovery is the analysis of retail sales data to identify seemingly unrelated products that are often purchased together. Other pattern discovery problems include detecting fraudulent credit card transactions and identifying anomalous data that could represent data entry keying errors.

Data mining techniques can yield the benefits of automation on existing software and hardware platforms, and can be implemented on new systems as existing platforms are upgraded and new products developed. When data mining tools are implemented on high performance parallel processing systems, they can analyze massive databases in minutes. Faster processing means that users can automatically experiment with more models to understand complex data. High speed makes it practical for users to analyze huge quantities of data. Larger databases, in turn, yield improved predictions.

**DATABASES CAN BE LARGER IN BOTH DEPTH AND BREADTH**

- **MORE COLUMNS.** Analysts must often limit the number of variables they examine when doing hands-on analysis due to time constraints. Yet variables that are discarded because they seem unimportant may carry information about unknown patterns. High performance data mining allows users to explore the full depth of a database, without preselecting a subset of variables.

- **MORE ROWS.** Larger samples yield lower estimation errors and variance, and allow users to make inferences about small but important segments of a population.

**HOW DATA MINING WORKS**

How exactly is data mining able to tell you important things that you didn't know or what is going to happen next? The technique that is used to perform these feats in data mining is called
modeling. Modeling is simply the act of building a model in one situation where you know the answer and then applying it to another situation that you don't.

This act of model building is thus something that people have been doing for a long time, certainly before the advent of computers or data mining technology. What happens on computers, however, is not much different than the way people build models. Computers are loaded up with lots of information about a variety of situations where an answer is known and then the data mining software on the computer must run through that data and distill the characteristics of the data that should go into the model. Once the model is built it can then be used in similar situations where you don't know the answer. For example, say that you are the director of marketing for a telecommunications company and you'd like to acquire some new long distance phone customers. You could just randomly go out and mail coupons to the general population - just as you could randomly sail the seas looking for sunken treasure. In neither case would you achieve the results you desired and of course you have the opportunity to do much better than random - you could use your business experience stored in your database to build a model.

As the marketing director you have access to a lot of information about all of your customers: their age, sex, credit history and long distance calling usage. The good news is that you also have a lot of information about your prospective customers: their age, sex, credit history etc. Your problem is that you don't know the long distance calling usage of these prospects (since they are most likely now customers of your competition). You'd like to concentrate on those prospects that have large amounts of long distance usage. You can accomplish this by building a model. Table 2 illustrates the data used for building a model for new customer prospecting in a data warehouse.

<table>
<thead>
<tr>
<th>TABLE NO. 2</th>
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<tbody>
<tr>
<td>DATA MINING FOR PROSPECTING</td>
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</table>

<table>
<thead>
<tr>
<th>General information (e.g. demographic data)</th>
<th>Customers</th>
<th>Prospects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proprietary information (e.g. customer transactions)</td>
<td>Known</td>
<td>Target</td>
</tr>
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The goal in prospecting is to make some calculated guesses about the information in the lower right hand quadrant based on the model that we build going from Customer General Information to Customer Proprietary Information. For instance, a simple model for a telecommunications company might be:
98% of my customers who make more than Rs.60,000/year spend more than Rs.5000/month on long distance

This model could then be applied to the prospect data to try to tell something about the proprietary information that this telecommunications company does not currently have access to. With this model in hand new customers can be selectively targeted.

Test marketing is an excellent source of data for this kind of modeling. Mining the results of a test market representing a broad but relatively small sample of prospects can provide a foundation for identifying good prospects in the overall market. Table 3 shows another common scenario for building models: predict what is going to happen in the future.

TABLE NO. 3
DATA MINING FOR PREDICTIONS

<table>
<thead>
<tr>
<th></th>
<th>Yesterday</th>
<th>Today</th>
<th>Tomorrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static information and current plans (e.g. demographic data, marketing plans)</td>
<td>Known</td>
<td>Known</td>
<td>Known</td>
</tr>
<tr>
<td>Dynamic information (e.g. customer transactions)</td>
<td>Known</td>
<td>Known</td>
<td>Target</td>
</tr>
</tbody>
</table>

If someone told you that he had a model that could predict customer usage how would you know if he really had a good model? The first thing you might try would be to ask him to apply his model to your customer base - where you already knew the answer. With data mining, the best way to accomplish this is by setting aside some of your data in a vault to isolate it from the mining process. Once the mining is complete, the results can be tested against the data held in the vault to confirm the model’s validity. If the model works, its observations should hold for the vaulted data.

PROFITABLE APPLICATIONS

A wide range of companies have deployed successful applications of data mining. While early adopters of this technology have tended to be in information-intensive industries such as financial services and direct mail marketing, the technology is applicable to any company looking to leverage a large data warehouse to better manage their customer relationships. Two critical factors for success with data mining are: a large, well-integrated data warehouse and a
well-defined understanding of the business process within which data mining is to be applied (such as customer prospecting, retention, campaign management, and so on).

Some successful application areas include:

- A pharmaceutical company can analyze its recent sales force activity and their results to improve targeting of high-value physicians and determine which marketing activities will have the greatest impact in the next few months. The data needs to include competitor market activity as well as information about the local health care systems. The results can be distributed to the sales force via a wide-area network that enables the representatives to review the recommendations from the perspective of the key attributes in the decision process. The ongoing, dynamic analysis of the data warehouse allows best practices from throughout the organization to be applied in specific sales situations.

- A credit card company can leverage its vast warehouse of customer transaction data to identify customers most likely to be interested in a new credit product. Using a small test mailing, the attributes of customers with an affinity for the product can be identified. Recent projects have indicated more than a 20-fold decrease in costs for targeted mailing campaigns over conventional approaches.

- A diversified transportation company with a large direct sales force can apply data mining to identify the best prospects for its services. Using data mining to analyze its own customer experience, this company can build a unique segmentation identifying the attributes of high-value prospects. Applying this segmentation to a general business database can yield a prioritized list of prospects by region.

- A large consumer package goods company can apply data mining to improve its sales process to retailers. Data from consumer panels, shipments, and competitor activity can be applied to understand the reasons for brand and store switching. Through this analysis, the manufacturer can select promotional strategies that best reach their target customer segments.

Each of these examples has a clear common ground. They leverage the knowledge about customers implicit in a data warehouse to reduce costs and improve the value of customer relationships. These organizations can now focus their efforts on the most important (profitable) customers and prospects, and design targeted marketing strategies to best reach them.

**DECISION-MAKING AND DATA MINING**

Data mining is currently in a state of growth and it needs further improvements to attain the development. More products are being developed, more businesses are incorporating the efforts of data mining into their decision making processes. Most of the successful business decisions are made from reliable data source and their validation through the application of tools and techniques. Most of the literature on data mining focuses on its benefits and burdens in making business decisions. Fayyad et al. (1996) defines the data mining methods as tools for searching databases with special algorithms to identify general patterns which can be used
in the classification of the individual observations and making predictions thereof. According to Weiss and Indurkhya, (1998) data mining is the search for valuable information in large volumes of data. According to Hand (1998) “data mining is the process of secondary analysis of large databases aimed at finding unsuspected relationships which are of interest or value to the database owners.” Data Mining has been referred as a statistical process of analyzing data stored in a warehouse (Decker, 1998).

Figure 1, shows the mining process and data mining methodology. The upper arrows indicate feedback loops, the dashed arrows indicate (potential) flows of domain knowledge. The depicted process essentially is compatible to the classical KDD process model introduced by Fayyad et al.(1996)(Fig.2)
Steps in knowledge discovery

As can be seen from the figure, domain knowledge not only drives the initial phase of data mining, understanding the business (problem). It might also be applied for preparing and mining the data and clearly affects the analyst’s satisfaction with the mining results as it ultimately determines the degree of their subjective interestingness. Furthermore, domain knowledge might in turn also be affected by the mining results, as these potentially lead to insights contradicting the initial knowledge and thus requiring feedback mechanisms for updating it. As already denoted earlier, the ultimate goal of data mining is to find interesting patterns in data.

DECISION MAKING ENVIRONMENT

Decisions are made based upon the availability of data as well as the decision situation that is environment. Basically there are three types of decision making environment (a) Certainty, (b) Uncertainty and (c) Risk.

(a) Decision-making under certainty: In this case the decision maker has the complete knowledge of consequence of every decision choice with certainty. Obviously he/she will select an alternative that yields the largest return (payoff) for the known future. In this decision model, certainty means that only one possible state of nature (future) exists.
(b) Decision making under uncertainty: In this case the decision maker is unable to specify the probabilities with which the various states of nature will occur. Thus, decisions under uncertainty are taken with even less information than decisions under risk. Most of the business decisions are based on the future planning of business operations, depending on the timeframe and seasonality factors.

(c) Decision-making under risk: In this case the decision-maker has less than the complete knowledge with certainty of the consequences of every decision choice. This means there is more than one state of nature and for which he/she makes an assumption of the probability with which each state of nature will occur.

Data mining tools help in formulation of both strategic and tactical decisions that are necessary for an organization to survive in the business, therefore data mining tools can be regarded as the best solutions to decision making under risk and uncertainty.

Data Mining covers the entire process of data analysis, including data cleaning and preparation and visualization of the results, and how to produce predictions in real-time, etc. The data mining enables the user to make effective utilization of the available information, to gain a better understanding of the past, and predict the future through better decision making. It includes everything from the data collection to the data processing, in terms of data description and inferences about the parameters under study. It lies in the fact that how one should select a decision from carefully analyzing the data and using the information at appropriate time. But one should know the process of reaching a decision in a scientific manner from the first stage “collection of data” to “processing of data” to “gathering facts” to the last stage in reaching “knowledge”. Data become information when they become relevant to the problem under investigation and information become facts when the data can support it, finally facts become knowledge when they are used in the successful completion of the decision process. Using of data mining is needed for the systematic process of decision making which includes laws of probability, multivariate analysis, inferential statistics, econometrics etc.

Decision making is a post-processing tool which helps the user to make selection of the best solution. Fig.4 shows the process of decision making where a decision maker selects one course of action from many possibilities. An additional difficulty is the fact that the decision maker or optimizer is not necessarily an expert in the field of the decision making process so as to be able to correctly identify effective and valuable variables. Hence, getting help for analyzing the input variables and decision-making variables from an intelligent computational system seems to be necessary. For instance Khatharina et al (2002) utilized a data mining(Fig.4) tool for supporting the process of decision making.
SUMMARY

Comprehensive data warehouses that integrate operational data with customer, supplier, and market information have resulted in an explosion of information. Competition requires timely and sophisticated analysis on an integrated view of the data. However, there is a growing gap between more powerful storage and retrieval systems and the users’ ability to effectively analyze and act on the information they contain. A new technological leap is needed to structure and prioritize information for specific end-user problems. The data mining tools can make this leap. Quantifiable business benefits have been proven through the integration of data mining with current information systems, and new products are on the horizon that will bring this integration to an even wider audience of users.

Data mining has clearly moved into the mainstream. This approach to discovering previously unknown patterns or connections in data was developed in academia and first employed by government research labs. Now it plays a central role in helping companies in virtually every industry improve daily business decision-making. Modeler is an effective data mining tool for supporting improvements in customer relationship management (CRM). More cost-effective customer acquisition and retention, better targeting of marketing campaigns, improved cross-selling and up-selling to increase customer value – these are just some of the customer issues that leading companies address through data mining. Data mining is a key component of predictive analytics. Through predictive analytics, companies can use insights gained by analyzing data to direct, optimize, and automate customer-focused interactions, anywhere in organization.
CONCLUSION

In spite of accuracy of insight that data mining provides, it is not by enchantment or miracle. It’s a valuable business tool that organizations around the globe are successfully using to make critical business decisions about customer acquisition and retention, customer value management, marketing optimization, and other customer-related issues. Similarly, the keys to effectively using data mining are not secret or mysterious. With a solid understanding of the issues to be addressed, appropriate resources and support and the right solution, one can experience the business benefits that other organizations are reaping from data mining.

Exploring the valuable data with data mining techniques and processing of such data by statistical software is gaining importance in today’s business community. All national and multinational companies are using various data mining techniques and analytics to explore the relationship between various micro and macro economic factors and make policies using data analytics. In recent times statistical analytics software gaining its importance due to the diversified applications of statistics in both quantitative and qualitative phenomenon. Integration of technology with the human driven analytics has made the process of retrieving information easier compared to earlier times. The ideal applications of data mining and statistics require the use of computer science and client’s domain knowledge, unfortunately in today’s research community this coordination is missing. Hence for successful knowledge discovery we need the coordination among the disciplines statistics-data mining, computer science and domain knowledge, if this coordination comes into reality then definitely we see wider applications of data mining in almost all the areas of research institutions. Hence, innovative approach to revive this sector becomes very important.

SOME SUGGESTIONS FOR CREATIVE DECISIONS, USING DATA MINING TOOLS:

1. PLANNING IS THE KEY TO A SUCCESSFUL DATA MINING PROJECT

As with any worthwhile endeavor, planning is half the battle. It is critical that any organization considering a data mining project first define project objectives from a business perspective and then convert this knowledge into a coherent data mining strategy and a well-defined project plan. Prior to modeling, define a project that supports organization’s strategic objectives. For example, any company’s business objective may be to attract additional customers who are similar to most valuable current customers. Or it might be to keep most profitable customers longer. Then get buy-in from business stakeholders. Be sure to involve all those who have a stake in the project. Typically, Finance, Sales and Marketing are concerned with devising cost-effective strategies. But Database and Information Technology managers are also “interested parties” since their teams are often called upon to support the execution of those strategies. Define an executable data mining strategy. Plan how to achieve the objective by capitalizing on resources. Both technical and staff resources must be taken into account.
2. SET SPECIFIC GOALS FOR DATA MINING PROJECT

Before beginning a data mining project, clarify just how data mining can help to achieve the goal. For instance, if reducing customer defection or “churn” is a strategic objective, what level of improvement is necessary? Commit to a standard data mining process, for business understanding, data understanding, customer intimacy, data preparation, modeling, evaluation and deployment. This methodology can provide an excellent starting point for data mining efforts.

- Assess and prioritize business issues
- Articulate data mining methods to solve them
- Apply data mining techniques
- Interpret data mining results
- Deploy and maintain data mining results

Then create a project plan for achieving goals, including a clear definition of what will constitute “success.” Finally, complete a cost-benefit analysis, taking care to include the cost of any resources that will be required.

3. RECRUIT A BROAD-BASED PROJECT TEAM

One of the most common mistakes made by those new to data mining is to simply pass responsibility for a data mining initiative to a data miner. Because successful data mining requires a clear understanding of the business problem being addressed, and because in most organizations elements of that business understanding are dispersed among different disciplines or departments, it’s important to recruit a broad-based team for any project. For instance, to evaluate the factors involved in customer churn, it may need staff members from Customer Service, Market Research or even Billing, as well as those with specialized knowledge of data resources and data mining.

Depending upon objective, one may want to have representatives from some or all of the following roles: executive sponsor, project leader, business expert, data miner, data expert and IT sponsor. Some projects may require two or three people; other projects may require more.

4. LINE UP THE RIGHT DATA

To help ensure success, it is critical to understand what kinds of data are available and what condition that data is in. Begin with data that is readily accessible. It doesn’t need to be a large amount or organized in a data warehouse. Many useful data mining projects are performed on small or medium-sized datasets – some, containing only a few hundreds or thousands of records. For example, it may be able to determine, from a sample of customer records, from company’s products which are typically purchased by customers fitting a certain demographic profile. This
enables to predict what other customers might purchase or what offers they might find most appealing.

5. SECURE IT BUY-IN

IT is an important component of any successful data mining initiative. Keep in mind that the data mining tool selected will play an important role in securing buy-in from IT department. The data mining tool should integrate with existing data infrastructure – relevant databases, data warehouses, and data marts – and should provide open access to data and the capability to enhance existing databases with scores and predictions generated by data mining.

6. SELECT THE RIGHT DATA MINING SOLUTION

Select a good modeler that saves organizations time and improves the flow of analysis by supporting every step of the process and ensuring an efficient and successful data mining project. An integrated solution is particularly important when incorporating additional types of data, such as text, web or survey data. That’s because each type of data is likely to originate in a different system and exist in a variety of formats. Using an integrated solution enables analysts to follow a train of thought efficiently, regardless of the type of data involved in the analysis. Integration is also important during the “decision management” phase of predictive analytics. Decision management determines which actions will drive optimal outcomes, and then delivers those recommended actions to the systems or people that can effectively implement them. To support decision management, they may want a solution that links to operational systems, such as call center or marketing automation software. Such a solution supports more widespread and rapid – even real-time – delivery of predictive insight.

7. CONSIDER MINING OTHER TYPES OF DATA TO INCREASE THE RETURN ON DATA MINING INVESTMENT

When one combines text, web or survey data with structured data used in building models, enrich the information available for prediction. Even if adding only one type of additional data, one will see an improvement in the results that generated. Incorporating multiple types of data will provide even greater improvements.

To determine if the company benefited or not from incorporating additional types of data, begin by asking the following questions: What kinds of business problems are they trying to solve? What kinds of data do they need to solve these problems? The answers to these questions will help to determine what kinds of data to include, and why. If they are trying to learn why long-time customers are leaving, for example, if they want to analyze text from call center notes combined with results of customer focus groups or customer satisfaction surveys.

8. EXPAND THE SCOPE OF DATA MINING TO ACHIEVE EVEN GREATER RESULTS

One way that one can increase the ROI generated by data mining is by expanding the number of projects they undertake. Gain more from investment in data mining either by addressing
additional related business challenges or by applying data mining in different departments or geographic regions.

9. CONSIDER ALL AVAILABLE DEPLOYMENT OPTIONS

When mining data, organizations that efficiently deploy results consistently achieve a higher ROI. In early implementations of data mining, deployment consisted of providing analysts with models and managers with reports. Models and reports had to be interpreted by managers or staff before strategic or tactical plans could be developed.

Later, many companies used batch scoring – often conducted at off-peak hours – to more efficiently incorporate updated predictions in their databases. It even became possible to automate the scheduling of updates and to embed scoring engines within existing applications.

Today, using the latest data mining technologies, one can update even massive datasets containing billions of scores in just a few hours. One can also update models in real time and deploy results to customer contact staff as they interact with customers. In addition, they can deploy models or scores in real time to systems that generate sales offers automatically or make product suggestions to website visitors, to name just two possibilities.

10. INCREASE COLLABORATION AND EFFICIENCY THROUGH MODEL MANAGEMENT

Look into data mining solutions that enable to centralize the management of data mining models and support the automation of processes such as the updating of customer scores. These solutions foster greater collaboration and enterprise efficiency. Central model management also helps the organization to avoid wasted or duplicated effort while ensuring that most effective predictive models are applied to business challenges. Model management also provides a way to document model creation, usage, and application.

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