

STEELCASE ASKS TOUGH QUESTIONS TO IMPROVE CUSTOMER EXPERIENCE

Steelcase Inc. has been the sales leader in the office furniture industry for 30 years, providing innovative build-to-order products and services for businesses worldwide. With manufacturing facilities in 35 locations, 14,000 employees around the world, and dealers in over 900 locations, Steelcase is dedicated to helping people work more effectively, while helping organizations use space more efficiently.

Known as an industry innovator, the company's product portfolio includes furniture systems, technology products, interior architecture products, seating, lighting, storage, and related products and services. Unlike traditional furniture manufacturers, Steelcase helps businesses create work environments that integrate the key elements of the modern office: architecture, furniture and technology.

CHALLENGE

Steelcase provides complex, build-to-order office furnishing solutions to end-customers through an extensive dealer network. In order to provide customized office environments for its customers' unique work spaces, Steelcase offers a huge array of product configurations spanning thousands of sizes, colors, fabric choices, and finishes. The breadth and depth of product and service offerings enable Steelcase customers to transform the way they utilize space and improve their workplace effectiveness.

In light of such unique customer needs, one of Steelcase's goals is to present as many options and as much flexibility as possible, while at the same time providing the best possible buying experience for customers and dealers. Steelcase achieves this by offering a variety of pricing strategies under which routine purchases are made. The business challenge is to design these pricing strategies so that they are flexible and simple, and help all parties—Steelcase, its dealers, and its end customers—to work together in a financially rewarding partnership.

Steelcase possesses significant amounts of demand-based transactional data accumulated from their successful Enterprise Resource Planning (ERP) and sales automation tools. They anticipated that these transactional databases contained valuable information that could support the decision making process to improve the design and deployment of their pricing strategies. However, successfully analyzing such large and complex data sources was likely to be a challenge that would stretch internal resources and experience beyond existing capabilities. Furthermore, Steelcase executives expected that new data mining technologies beyond their experience could be an important part of unlocking value from the data.

According to Steelcase CEO Jim Hackett, "We entered into this project with NuTech Solutions in order to add 'muscle memory'

to our internal data analysis efforts. We thought that if we could partner with data mining experts like NuTech to study our transactional sales data, we would not only be able to develop better pricing programs, but also learn about new technologies that could help us across our business." As a result, Steelcase asked NuTech to address the strategic issue of balancing a wide variety of pricing options, including diverse geographies, independent dealers, complex tiers, and many product combinations, with the need for end-customers and dealers to understand that it is easy and advantageous to deal with Steelcase.

SOLUTION

NuTech Solutions scientists joined the Steelcase project team to evaluate the demand-based transactional data in the company's data warehouses. To begin the process, NuTech suggested that Steelcase brainstorm a list of business questions that could potentially be answered by the data and that if answered would enable significant improvements in Steelcase's business. Combined with Steelcase's own technique of formally benchmarking improvement projects against existing hypotheses, these key business questions proved to be the foundation of a highly successful collaborative project. They were the tough questions that would change how Steelcase runs its business.



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Steelcase
CEO*



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Steelcase
Director of Pricing and Contracts*

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"We decided that we could get the biggest return by focusing first on high-value, easy-to-answer questions. We didn't expect that every question would yield gold; however, we did expect to see areas where our intuition would be challenged. Either case was going to be a win. Any time you can objectively support a hypothesis or prove it incorrect, is an opportunity to improve your business," said project leader John Shull, Director of Pricing and Contracts at Steelcase. "By drilling down into transactional sales data, I knew that we were going to learn a lot about how our pricing programs affect our dealers and customers, and that we were going to discover ways to improve how we design our pricing strategies."

NuTech Solutions used advanced data mining techniques, such as support vector machines, to examine how sales data influenced the design and development of Steelcase's pricing plans. During one portion of the analysis, NuTech scientists used a technique called matched case analysis to specifically determine if offering complex pricing with a variety of purchase choices was more helpful than a oversimplified structure.

Throughout the project, NuTech Solutions scientists and Steelcase database experts worked closely together to create a process for organizing sales data before it is mined. NuTech Solutions used advanced non-linear techniques to uncover the targeted patterns and relationships in the data. According to NuTech Solutions Senior Scientist Rich Perline, "Perhaps the greatest benefit of the data mining phase was to show Steelcase how to use the data they have, as well as to

modify the way Steelcase collects data for even greater benefits."

RESULT

Today, Steelcase offers specific product selection and configuration choices targeted to the needs of customers and dealers, while ensuring that such flexibility does not jeopardize Steelcase's ability to deliver these products at the right price and in the right time. "NuTech Solutions enabled us to unlock our data and come up with answers to key questions we had to meet our corporate goals and business objectives," noted Shull. "This generates huge benefits – both short-term and long-term. The big benefit that we have encountered at Steelcase is a more in-depth understanding of customer needs and trends, which has empowered us to get at those issues that much faster."

NuTech's data mining techniques confirmed Steelcase's hypotheses for six of the tough questions. This was a valuable confirmation, because the previous intuitive knowledge did not merit resource investment. As Shull explained, "Knowing that our beliefs were correct led us to take stronger action than we would have otherwise." The answers to four other questions provided new insights for the Steelcase team. The information revealed will enable Steelcase to modify its business processes to capture significant additional revenue.

"When NuTech Solutions asked us to list the ten most important questions to answer from the data, it was an incredibly liberating experience," said Shull. "Prior to our NuTech Solutions engagement, we only saw the reasons we couldn't answer those questions, given

the nature of our data. Once we told them what we wanted to know, NuTech Solutions found ways to interpret the data so that we could answer questions that we thought were unanswerable. The results will have a measurable impact on our business processes."

By working with NuTech Solutions, Steelcase created significant value from its transactional data. NuTech scientists used advanced data mining techniques to *let the data do the talking* and help Steelcase draw rational conclusions from complex information. The data revealed critical business information that Steelcase used to implement a well-supported action plan. "In providing us with the technology that identifies relationships out of our data, NuTech has applied science to our business," concluded Shull. "By improving data validity throughout the system, our whole process runs better. The bottom line for Steelcase is that our business processes have significantly improved – and the true beneficiaries are our customers and dealer network."





DON'T LOSE THE SHIRT OFF YOUR BACK - BOOST PROFITS WITH DYNAMIC PRICING

Executives responsible for profit margins know that all deals are not created equal. You make a good margin on some, and you take a loss on some. It's no secret that to be successful, you need to cut the losses. So, how can you use scientific tools to ensure that you are making the most profit on each deal?

NuTech Solutions recommends integrating knowledge of the current and future state of manufacturing operations, as well as predictions of orders that will be received in the future. By following this approach, a company optimizes profit based not only on current cost structures, but also on cost structures that will likely exist in the future based on demand prediction.

Take the simple example of a two-person company sewing T-shirts. One person sews in Dallas, the other in Fort Worth. At any given time, a certain color of shirts is sewn in a location. For this example, assume that Dallas is sewing blue shirts, and Fort Worth is sewing red shirts. If an order comes in to Dallas for a blue shirt, the price of \$10 gives the desired profit because it fits easily into the production schedule.

If an order comes in to Dallas for a red shirt, the price of \$10 will yield less profit because the sewing operation has to change-over to red cloth and thread. The Dallas operation may decide to actually source the red shirt from Fort Worth because the additional shipping cost is less of a profit drain than the change-over cost. This is basic economics, and a well-integrated enterprise system can make

these costs and associated profits visible for a company. If the system is real-time, customer service personnel can actually quote variable pricing to customers based on this information. In this case, in order to maintain desired profit levels for Dallas-based sales, the company could offer the red shirt for \$15 sourced from Fort Worth, or \$20 based on a change-over in Dallas.

But what if the Dallas sales office could predict the future? For example, what if the next 10 orders into the Dallas operation were also for red shirts (because the holidays are approaching)? In that case, the change-over cost from blue shirts would be diluted by the ongoing production of a volume of red shirts. And thus, the price necessary to maintain the desired profit levels could be approaching the \$10 level of the original blue shirts.

Why is this significant? Because it is the vision into the future that provides the company with the confidence to sell at the consumer-attractive price of \$10, knowing that its ongoing cost structure, given predicted future business volume, will support desired margins at \$10.

Now consider simulating future demand for a multi-division, geographically diverse multi-plant corporation with global customers placing orders for today, for two-weeks-from-today, and two-months-from-today. Future realities for sourcing markets, transportation costs, and manufacturing costs, as well as customer demand, must be considered, and integrated into enterprise supply chain management systems.

Given these highly complex supply chain networks and manufacturing interdependencies, NuTech Solutions' team of PhD scientists use Intelligent Business Engines™ to create reliable models of future demand and costs. The models constantly adapt to ongoing inputs from sales, manufacturing and shipping to consistently deliver the most up-to-the-minute vision of the future. As a result, companies can rely on this predicted revenue and cost structure to dynamically adjust prices to achieve the 'best' margin at all times.

With NuTech's Intelligent Business Engines working for you, knowledge of the future becomes the great equalizer. And in the future, all deals can be created equal.



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STRENGTH IN NUMBERS: AN OPTIMAL SOLUTION FOR DENTSU



What happens when you combine the largest Japanese advertising company together with a company known for using cutting-edge technologies to solve complex business problems?

You achieve a truly “optimized” solution.

OPTIMIZATION CHALLENGE

Dentsu, founded in 1901, is the Japanese market leader with a diversified client portfolio of over 6,000 advertisers. Its global reach extends to 20 countries and regions in Asia, Europe, and the Americas (as of March 31, 2004).

Dentsu’s “Total Communications Services” offering uses both traditional media including newspapers, magazines, television, and radio—as well as “new” media such as the Internet and Satellite Broadcasting. Their expertise centers on sales promotions, event marketing, sports marketing, public relations, planning, creative development, brand consulting, and media planning.

Dentsu and NuTech are both well experienced in applying optimization techniques to solve various business problems. Dentsu’s knowledge in this area was used to develop DiaLog® - its multimedia optimizer. This tool makes it possible to design an effective advertising campaign by choosing an optimal media mix within a pre-defined budget. It also optimally allocates available budgets through a variety of products produced by a given client while at the same

time selecting the most effective channel for each one. DiaLog has acquired success in Asia by yielding a competitive advantage over other advertising agencies in large part due to its customization that takes advantage of individual market dynamics.

Dentsu’s Dialog offering includes a multi-brand optimizer feature that helps clients determine the optimal allocation of their advertising budget among diverse advertising products. It inherently functions to provide optimal media allocation for each individual product and budget allocation by media type after the total advertising expenditure has been allocated to the product. Its goal is to reduce advertising expenditures to the primary estimated cost while clients continue to achieve the same level of media effects as initially planned.

MULTI-OBJECTIVE OPTIMIZATION

The benefits Dentsu obtains from NuTech Solutions’ extensive knowledge and experience conducting a multi-objective optimization are significant. Multi-objective optimization is a technique that makes it possible to solve problems with several conflicting goals. Everyday “real world” problems too often have several competing goals, such as time, place, color, size and cost. Multi-objective optimization considers all the goals and satisfies all of them simultaneously.

To solve these problems NuTech applies evolutionary algorithms, a powerful technique

often used for multi-objective optimization. Evolutionary algorithms work by “evolving” an entire solution all at once, adapting it gradually towards an optimal balance between goals. These algorithms operate using rules of selection and mutation, discovering complete solutions that balance the trade-off between conflicting goals. As a result, they can arrive at a solution faster, using less computational resources.

Quality knows quality, and Dentsu, a proven leader in applied optimization for their internal needs, chose NuTech Solutions to apply state-of-the-art optimization algorithms to enhance their business.

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ENSEMBLE MODELING LEARNING WHO TO LISTEN TO AND WHEN

One of life's crucial skills is learning how to interpret and benefit from contradictory advice. Your friends are all eager to give you advice, but you will live better if you know which one to trust for movie reviews, which one for business advice, and which one for recipe suggestions. When it comes to building models of business processes, NuTech Solutions' scientists use a variety of techniques to learn from business data, and, much like your helpful friends, those techniques don't always agree when predicting the future. Fortunately, NuTech's Intelligent Business Engine™ library of modeling techniques contains higher-level components that specialize in learning who to listen to and when.

NuTech Solutions' Intelligent Business Engines for modeling include techniques that are good at mathematical data, handling numerical values and building mathematical models. There are

others that are good at exploiting facts, such as associating sales volume with ad campaigns and the type of car a consumer drives. In the course of creating models, some techniques build nets, some build trees, some build sets of rules, and each of these approaches has its strengths and weaknesses.

To improve the performance of individual models and to increase their power, NuTech Solutions enhances these models with specialized systems whose job is to "learn" which model to listen to when. Sometimes NuTech scientists design these special learning systems to weight the recommendations of different models.

"We call this technique 'ensemble modeling,'" said Rich Perline, NuTech's Senior Data Mining Scientist. "It lets each modeling technique concentrate on the things it does best."

NuTech scientists have developed these specialized ensemble modeling techniques as a part of the Intelligent Business Engines repository. Similar functionality is not found in standard modeling toolkits that are commercially available. NuTech Solutions' customers gain the benefit of greatly improved modeling performance provided by the advanced Intelligent Business Engines.

"An ensemble modeling approach will trade off the benefits of each of the different modeling technologies until you reach a composite technology that is hybrid – and significantly better than any of the individual modeling technologies alone," said Pete Angeline, Ph.D., NuTech Solutions' Vice President of Products. "The result is great value for our customers."



NUTECH RESEARCH FOR SBA REVEALS INSIGHTS INTO BUSINESS GROWTH RATES

The distribution of business growth rates is different from that previously assumed by economists. This is the central finding of a new paper released [January 7th] by the Office of Advocacy of the Small Business Administration (SBA) before the American Social Sciences Association in Philadelphia.

Conducted to better understand the dynamic nature of growth and decline of firms of all sizes, the report breaks new ground in understanding the United States economy. Based on the report's

findings, economists may want to reevaluate their econometric tools when modeling the growth of businesses.

Written by Daniel Teitelbaum and Robert Axtell representing NuTech Solutions, with funding from the Office of Advocacy, *Firm Size Dynamics of Industries: Stochastic Growth Processes, Large Fluctuations, and the Population of Firms as a Complex System*, provides three main findings:

- ◆ Firm growth rates are not normally distributed, but

have strong "tails" among slower and faster growing firms

- ◆ Firm growth rate distributions do not differ much by type of industry
- ◆ Firm growth rates do not depend on the size of the establishments studied

"This research will provide economists and policy makers with new data and new tools to help them understand how our economy works. By using new data sets, economists are now able to provide solid grounding for policy proposals."

*- Dr. Chad Montray
Office of Advocacy
Chief Economist*

*- Office of Advocacy of the U.S.
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NUTECH PARTNERS WITH ADVANCED RESOURCES INTERNATIONAL

"Partnering with a leader in optimization solutions enables us to deepen our client relationships, ensure that clients generate value from our consulting recommendations, and broaden our service offerings."

- Scott Reeves
Executive Vice President
ARI

NuTech Solutions, specializing in advanced predictive analytics for the petroleum industry, has formed a strategic alliance with Advanced Resources International (ARI) to mutually increase the breadth of solutions offered to the upstream oil and gas industry.

Advanced Resources' team, which provides oil and gas consulting services for geology, geophysics, petroleum engineering, and strategic planning, will now recommend NuTech's solutions for their clients with reservoir simulation and operational optimization requirements.

"Partnering with a leader in optimization solutions enables us to deepen our client relationships, ensure that clients generate value from our consulting recommendations, and broaden our service offerings," said Scott Reeves, Executive Vice President of Advanced Resources International.

NuTech's Intelligent Business Engines™ provide adaptive solutions for the petroleum industry, including Enhanced Oil Recovery and Workover and Pipeline Logistics Optimization. "NuTech increases our value to the customer by incorporating

ARI's strategic and engineering consulting as a foundation for generating the benefits of our advanced science for the petroleum industry," said Tom Wilson, CEO of NuTech Solutions. "We look forward to enhancing the value we deliver to our mutual clients through this partnership with ARI."

BEIERSDORF AG RELIES ON NUTECH'S CLEARVU FORMULATIONS ENGINE

"With NuTech's ClearVu Formulations engine, we satisfied all the technical requirements faster than with traditional processes, and now have a new product we will bring to the market."

- Dr. Thomas Hillemann
Beiersdorf AG

NuTech Solutions, a leader in the commercialization of evolutionary computation software for advanced predictive analytics, is making research and development more innovative and efficient at Beiersdorf AG.

Faced with constantly changing market requirements, Beiersdorf needed a creative way to discover new product formulations, while at the same time decreasing product development time. Beiersdorf engaged NuTech Solutions to apply their ClearVu Formulations engine, containing NuTech's data mining and optimization tools, to these challenges in new product formulation.

Using a virtual formulation development process, models predict characteristics of

suggested combinations of ingredients and quantities, improving the resulting recipe by reincorporating the desirable attributes with each subsequent model. As a result, ingredients not considered by traditional approaches are suggested by ClearVu Formulations.

"Our past experience limited our trials to include only familiar ingredients, and the lengthy process of attempting each combination had led us to declare the desired product infeasible after three months of research," said Thomas Hillemann, PhD, from Beiersdorf. "However, with NuTech's ClearVu Formulations engine, we satisfied all the technical requirements faster than with traditional processes, and now have a new product we will bring to the market."

Product development time is significantly reduced with the ClearVu Formulations engine because the model's predictions automatically rule out unrealistic experiments, allowing scientists to conduct only those tests with potentially positive outcomes.

"NuTech's solution helped Beiersdorf learn more about their formulations and minimize investment in time and testing by targeting their efforts on relevant experiments," said Thomas Bäck, PhD, President of NuTech Solutions, Germany. "We're focusing on helping other life sciences companies use ClearVu Formulations to recognize the same savings."

