SAS: Where it’s been and where it’s headed

SAS is the world’s largest privately held software company, with 70,000 customer sites in 138 countries, including 93 of the top 100 companies on the 2014 Fortune Global 500 list. SAS’ strengths in advanced analytics – statistics, data mining, machine learning, econometrics, forecasting and operations research – along with data management capabilities lie at the heart of its success since it was founded in 1976.

SAS software grew out of a North Carolina State University project to analyze crop yield data for the U.S. Department of Agriculture. It didn’t take long for industry to also see the value of SAS software for data analysis. Growth in the SAS product portfolio has paralleled industry increases in computing power. Data transformations and numerical algorithms are a foundation of product research and development at SAS.

The SAS product portfolio evolved significantly over the years with the addition of business-focused solutions that serve a variety of industry needs while building upon SAS’ highly regarded analytics software. As SAS extended its reach into industry-specific solutions, it also pushed into new geographical markets. The result: With annual sales of $3 billion, SAS is now the preeminent supplier of advanced analytics to businesses, governments and other organizations.

The uses of SAS software are innumerable, but here are a few examples:

• A retailer runs markdown optimizations in minutes rather than days, increasing profit and revenue.
• A financial institution uses data to spot anomalies so quickly that the firm can stop fraudulent credit card purchases before the transaction is completed.
• A pharmacy management company lowers costs and keeps patients out of the hospital by identifying those who need assistance managing their chronic conditions and prescription medications.
• An insurance company uses predictive analytics to determine the best new lines of business to enter.

“SAS’ strengths in advanced analytics — statistics, data mining, machine learning, econometrics, forecasting and operations research — along with data management capabilities — lie at the heart of its success. We have a very close working relationship with our customers,” says Radhika Kulkarni, SAS vice president of Advanced Analytics Research and Development, and a longtime advocate of operations research and advanced analytics.”

“By Kathy Lange
Roundtable Profile

An aerial view of SAS’ picturesque world headquarters campus in Cary, N.C.
of the most challenging problems customers need help solving.”

**Reputation Built with People**

SAS has had a remarkable uninterrupted run on Fortune’s list of 100 Best Companies to Work For in the U.S., where it is currently ranked second [1]. This springs from SAS CEO Jim Goodnight’s philosophy: “Treat employees like they make a difference and they will.”

SAS attracts and retains creative employees because doing so directly contributes to consistent revenue growth and profitability. As CEO, Goodnight is fond of saying the company’s most important “assets” drive out the gate every evening, and he wants to see them drive back in the gate the next morning.

“In our industry, rapid innovation and extreme customer care are essential,” Goodnight says. “The best way to make that happen is by supporting people. We have spent decades perfecting a culture and work environment that encourages creativity by addressing the day-to-day stresses and concerns that employees inevitably bring to work.”

The approach extends to its global offices. Last year, SAS ranked No. 2 on the elite Top 25 World’s Best Multinational Workplaces [2] list from Great Place to Work® [3].

**SAS Advanced Analytics and Operations Research**

With a culture that supports creativity and innovation, SAS helped shape the role of advanced analytics and operations research plays in organizations. SAS continues to support the demands of researchers and practitioners by adding new advanced analytics functionality every year, supported by a highly trained staff of research statistician developers and operations research specialists with advanced degrees.

SAS has significantly increased R&D investment in its entire advanced analytics portfolio but especially in operations research, and more specifically, optimization, discrete event simulation and network analysis. The family of optimization solvers play an important supporting role in other analytical tools from SAS, but they also enable optimization-based business solutions like SAS Marketing Optimization and SAS Revenue Management and SAS Pricing Optimization, which extend the benefit of operations research to a broader class of business users and organizations.

The Advanced Analytics R&D organization also houses the Advanced Analytics and Optimization Services group that supports customers with modeling and algorithmic expertise. One ongoing project of this group was joint work with a large consumer packaged goods company, where SAS collaborated on the application of statistical and optimization techniques for product portfolio analysis. This project was a finalist for the 2014 Wagner Prize for Excellence in O.R. Practice and involved developing an innovative algorithmic and computational solution.

Another example is a discrete event simulation customer project from Duke University Hospital. The organization’s neonatal intensive care unit used SAS Simulation Studio to study the effect of staffing levels and other policies on health outcomes and operational efficiency.

“When we can engage with customers, it is very rewarding for us as researchers and developers, since we can see tangible, real-world results from our R&D efforts,” says Manoj Chari, SAS senior director, Advanced Analytics R&D. He has overall responsibility for SAS R&D Operations Research and related areas.

SAS R&D endeavors to share insights with the broader research and practitioner community by active involvement in professional communities, such as INFORMS and the American Statistical Association. SAS OR R&D strives for excellence with the goal of continuing SAS’ leadership in the advanced analytics market. In the era of big data, many of the challenges that customers face are the sheer volume, scale and complexity of data, as well as new classes of business questions.

A significant amount of current SAS R&D efforts involve developing software infrastructure, as well as techniques to address these new data paradigms and computing architectures. SAS has significantly invested in developing integration with Hadoop-based data ecosystems. SAS has extended its analytics product portfolio, enabling key functions to run in high-performance, massively parallel distributed computed environments, including batch analytics computations, as well as interactive and visual analysis of any size data.

**Support for the Next Generation**

With its roots in academia, SAS has a strong commitment to supporting the development of future O.R. practitioners,

---

**All About the Roundtable**

The Roundtable consists of the institutional members of INFORMS with member company representatives typically the overall leader of O.R. activity. The Roundtable is composed of about 50 organizations that have demonstrated leadership in the application of O.R. and advanced analytics. The Roundtable culture is peer-to-peer, encouraging networking and sharing lessons learned among members.

The Roundtable meets three times a year. Roundtable goals are to improve member organizations’ OR/MS practice, help Roundtable representatives grow professionally and help the OR/MS profession to thrive. Further information is available at http://roundtable.informs.org.

The Roundtable also has an advisory responsibility to INFORMS. According to its bylaws, “The Roundtable shall regularly share with INFORMS leadership and advise the INFORMS Board on its views, its suggested initiatives and its implementation plans on the important problems and opportunities facing operations research and the management sciences as a profession and on the ways in which INFORMS can deal proactively with those problems and opportunities.” The Roundtable meets with the INFORMS president-elect each spring to discuss practice-related topics of interest to him or her, and with the entire INFORMS Board each fall to discuss topics of mutual concern.

This series of articles aims to share with the INFORMS membership at large some information and insights into how O.R. is carried on in practice today.
statisticians and data scientists. The company’s SAS Analytics U program provides free or low-cost licenses for the advanced analytics tools most used by academics, with the option to install the solutions onsite or access them on demand. Support is available for undergraduates, graduate students, academic research and institutional research.

SAS offers scholarships to conferences, opportunities to present at regional SAS user group conferences, SAS certification and a program known as the Data Mining Shootout – a competition to solve real-world data mining problems. Winners receive cash prizes and a trip to the annual SAS Analytics Conference, as well as a case study competition co-sponsored with the Analytics Section of INFORMS. The case study competition winners attend the INFORMS Conference on Business Analytics and Operations Research.

Classes and students using SAS routinely win praise for solving real-world problems:

- Oklahoma State University students modeled ways to market and time flu shot campaigns to reduce the viral illness’ impact on the community.
- Lehigh University students helped define a market opportunity in using liquefied natural gas and fuel cells to replace diesel fuel for selected railroad and mining industries.
- Franklin College students modeled various crimes as a function of time, weather, demographic information and other phenomena in multiple cities, and to recommend plans of action to prevent and deter these crimes based on future prediction of those variables.

SAS’ commitment to education also includes financial and practical support of many of the proliferating master of analytics programs, including the flagship N.C. State University Institute for Advanced Analytics. This program offers a master’s degree in analytics with the goal of producing individuals who have mastered complex methods and tools for large-scale data modeling, and who have a passion for solving challenging problems through teamwork.

A New INFORMS Fellow

SAS has been a longtime supporter of the INFORMS community, and as one recent example SAS R&DVP Kulkarni was inducted as an INFORMS Fellow in recognition of her contributions to practice and service to the profession. Kulkarni was hired 31 years ago as one of the first SAS/OR developers, but over the years she has taken increasingly significant leadership roles in the SAS R&D organization. Kulkarni was primarily responsible for laying down the vision of the role that O.R. could play in the larger SAS Advanced Analytics portfolio and building an R&D team that could implement the vision. She has also been very active in supporting the INFORMS community through her own services and through her encouragement of her team’s professional development and organizational service.

“My selection as a Fellow is recognition of the contribution that operations research has made to the advanced analytics portfolio at SAS in recent years,” Kulkarni says. “It is also a recognition of SAS support for INFORMS, especially in its efforts to become a premier organization for analytics professionals.”

Adds Armistead Sapp, SAS executive vice president and chief technology officer: “Radhika is a passionate voice for the critical role of operations research and advanced analytics at our company. The many hours she spends promoting the value of advanced analytics to business leaders have notably benefited our customers who continue to increase valuable insight into their enterprises. The analytics industry as a whole is better for her strong advocacy.”

Kulkarni’s ongoing advocacy of advanced analytics is grounded in building cutting-edge research into solutions that really matter: “We are not creating algorithms in an ivory tower and then throwing them over the fence and expecting that somebody will use them someday. We ask our customers what problems they are working on, and we drive to solve them like no other company.”

**Kathy Lange** is senior director, SAS Americas Technology Practice.

**REFERENCES**

Abstract Submissions Now Open!
http://meetings.informs.org/healthcare2015/abstract-submission

INFORMS Healthcare 2015 invites submissions on research and applications in the healthcare arena. We welcome submissions in either oral or poster formats, which will be reviewed by the Committee. There is a limit of one oral presentation per presenting/lead author. Authors may present a poster as well as one oral presentation.

DEADLINE FOR SELECTED PRESENTATIONS
March 1, 2015

DEADLINE FOR POSTER PRESENTATIONS
March 15, 2015

INFORMS third conference on the health sector brings together researchers and stakeholders around the most current work in healthcare operations research, systems engineering, and analytics in one highly-focused conference.

- Cross-cultural view of healthcare systems and analysis of operational impacts.
- Structured networking opportunities, including birds-of-a-feather discussion groups and facilitated networking over lunch.
- Collegial, small-scale setting in a vibrant location in one of the fastest growing cities in the U.S.

JULY 29-31
OMNI HOTEL

http://meetings.informs.org/healthcare2015