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How Operations Research Drives Success at P&G

By Andrew Hines

You can't just call it a company anymore — it's more of an economy unto itself. With \$76 billion in annual sales, 138,000 employees, and operations in more than 80 countries, Procter & Gamble, the world's biggest consumer goods company, has grown to such epic proportions that economists consider it a bellwether of consumer spending and confidence. Among the more than 300 brands it sells globally, from Gillette and Crest to Scope and Swiffer, 22 generate more than \$1 billion in annual revenue. Another 18 pull in at least \$500 million.

Yet there's an entirely different element of P&G's success that doesn't show up on the balance sheet, and which figures into almost every key decision driving sales and profits — from choosing the right brand names to slap on new products to precise juggling of global inventories. The secret ingredient? Data — some 900 terabytes of total capacity, 50 TB more than Google searches every day — that P&G uses to measure and optimize almost everything it does.

Three decades ago, P&G's cadre of data analysts was programming simplistic queries into mainframe computers to determine, for instance, the best time of day to deploy television advertising. It mostly trusted executives' instincts when deciding when to launch a new product or how much inventory to put on store shelves. These days, thanks to exponentially more powerful computers, data retrieval and storage, and new generations of software, it's a central army of "quants" at P&G who are arguably as important to its overall success as those storied P&G brand managers.

The company has raced to the forefront of data innovation in recent years, and has turned analytics — or operations research (OR), as it's more widely known — into a competitive edge that few others fully understand. As Brenda Dietrich, an IBM fellow at IBM's Watson Research Center, explains, "There's a gap between the math professionals and the nonmath executives in many companies. The companies who have people who can walk into a business meeting and tell executives how to use OR tools are the ones who've got the edge. Deployment is no longer done just by the math people; analytics has become much more usable by a broader set of people within an organization."

At P&G, it's top quants like Glenn Wegryn, associate director of product supply analytics, who have quietly led the data revolution. Wegryn's team of 20 analytics pros combines enterprise-scale simulation and risk assessment software with in-house tool sets to help streamline supply chains, launch new brands, generate internal workflow models and tackle a host of other operational and organizational problems. According to Wegryn, P&G doesn't make any significant analyses on supply-chain structure without input from his team, since data crunching that can improve the slightest of margins in a company of P&G's size can generate huge dividends. "The consumer products industry is cost driven, and a lot of it is commodity type in nature," Wegryn explains. "So very efficient and effective supply chains are critical for success and the ultimate profitability of the company. OR techniques, when utilized effectively, save costs, reduce cash investments and inventory, and can even improve top-line growth."

P&G, GE, Merrill Lynch, UPS — the list of Fortune 500 companies getting into the OR game is expanding, says Mark Doherty, executive director of the Hanover, MD-based Institute for Operations Research and Management Sciences (INFORMS), an OR think tank. "In the private sector, OR is the secret weapon that helps companies tackle complex problems in manufacturing, supply chain management, health care, and transportation," he says. "In government, OR helps the military create and evaluate strategies. It also helps the Department of Homeland Security develop models of terrorist threats. That's why OR is increasingly referred to as the 'science of better.'"

Rise of the Quants

The current analytics strategy at P&G took root in 1992, when Wegryn and a team of analytic professionals took on a daunting challenge: The company had too many manufacturing plants scattered around the country, and needed to eliminate redundant capacity, figure out optimal inventory holding policies, and develop other techniques that could optimize a supply chain that spanned continents. The data formulas Wegryn began churning through weighed myriad factors, including the impact of NAFTA on operations, trucking deregulation, and redundant capacity issues. The team, which included 30 managers and upwards of 1,000 employees around the country, spent a little less than a year devising tools that generated various consolidation scenarios. The team's recommendations ultimately allowed P&G to shut down multiple plants and have since generated more than \$1 billion in cost savings.

Small wonder, then, why mathematicians are in on business decision making in many companies, not just P&G. Entire companies today — Google, for one — are being built almost entirely on mathematical modeling. “We all know the slogan ‘Intel Inside,’” says Vijay Mehrotra, professor of decision science at San Francisco State University. “But we don’t automatically think, ‘Is there OR inside?’ And yet there is, in a staggering number of things. When you book a car with Hertz, and instead of saying, ‘It’s unavailable,’ they say, ‘It’s available for \$59, not \$39’ — *that’s* OR inside. Today it’s embedded in the way we do business.”

P&G’s Killer Apps in OR

Streamlining manufacturing plants was just the start. Here are a handful of other killer apps in OR that Wegryn has since developed and refined at P&G:

New product branding: Several years ago, Wegryn used decision analysis techniques to help managers decide to use Crest as the brand name on Crest White Strips. Granted, that might seem like a no-brainer, but it was a complex decision because the teeth-whitening category was new — a situation in which a new, stand-alone brand name would perhaps make sense. P&G turned to their analytics team to sort matters out, and, as a result, Crest was chosen as the brand. Wegryn says the process involved “getting clear on the question, evaluating options, understanding the uncertainties, and analyzing the best decision that you have available. In the end it was decided to use the brand equity Crest had.”

Sourcing materials: Every product at P&G requires myriad materials, obtained from hundreds of different sources worldwide. Using OR techniques, Wegryn’s team analyzes which source is optimal for every product. “A lot of times, there’s service and quality considerations,” Wegryn says. “We also measure whether a manufacturer really has the capability to deliver the materials at the quoted price.” For instance, retail clients of P&G spend \$140 million per year on in-store displays for P&G brands in the United States alone, often buying the display from one vendor. By using OR to determine the best source via a Web interface, P&G now pockets nearly \$67 million annually in cost savings and has slashed the order-and-delivery cycle for store displays from 20 weeks to just eight.

International trade and finance: P&G has ground operations in 86 countries, posing huge logistical and financial challenges. With products constantly crossing national borders, P&G is exposed to considerable exchange rate risk, where margins can be squeezed by the tiniest movements in currency. Wegryn’s group taps into software that helps predict optimal exchange rates and allows plant managers to shift production accordingly. “Let’s say there’s one plant in the US and one in Europe,” Wegryn explains. “Based on the exchange rate, we will adjust where we’re manufacturing and sourcing product from. It’s not a massive adjustment, but just a slight adjustment to minimize exchange exposure and maximize the profit, ultimately, for the business.”

Inventory management: At giant-sized P&G, inventory management is crucial to overall efficiency. “How much inventory do I need, and where do I need to have it,” explains Wegryn, “are really simple questions that are really hard to answer.” Using OR, the company now fine-tunes inventory dynamics. For example, conventional wisdom once held that adding a new warehouse to a supply chain would always add inventory into the system as well, ratcheting up costs. But using analytic methods, Wegryn’s team poked holes in this assumption, showing that new inventory need not be added. Their work was able not only to economically justify a new warehouse, but by using better methods, they were also able to track and put exactly the right

amount of inventory in the system, reducing overhead costs. “The huge deal about this application of OR is that we’ve been doing it for 15 years,” he says. “It’s used in every area of P&G.”

Organizational design: Wegryn hasn’t aimed OR’s powerful lens on just strategic problems, but internal management challenges as well. Over the past few years, Wegryn has developed simulation models that help execs in each of the company’s five major business organizations keep tabs on their organizational structure and inflow of talent. Taking into account variables such as hiring rates, attrition, retirement, movement between jobs, promotion rates, and so on, the quants created a “flow model” that shows managers what the likely flow of people moving in, out, and within an organization will be over the course of months or years, helping them to determine where they should be hiring most and when.

Toward “OR Inside”

One of the first myths about OR is that it applies only to operational issues. By every measure at P&G, however, OR is a cross-functional discipline applied to anything from executive compensation to inventory management. Wegryn says his analytics group looks at every business problem and asks: “Is it a strategic problem, is it a structural problem, or is it an operational problem? We are called into various problems throughout the entire spectrum.”

P&G’s OR tools fall into four broad categories, according to Wegryn: structured analytical modeling using a spreadsheet-type technology; decision-making analysis methods; mathematical modeling in the form of optimization; and simulation technology.

Within those categories, Wegryn has subsets. One he calls “OR inside” — packaged tool sets from an enterprise vendor. P&G uses outside vendors for optimization software, simulation software, object-based simulation modeling tools, and risk assessment software for decision analysis. Wegryn believes that embedded analytics in commercially available packages are a baseline for any big company to stay in the game. “Our competitors utilize OR tools that are embedded in solutions, as we do, and that is simply to stay competitive.”

But “canned” OR doesn’t come prepackaged with what Wegryn calls “company intelligence” — data that’s specific to the nature of a particular company’s problems and challenges. That’s where “applied OR” comes in. Applied OR is project-specific, utilizing customized tools developed by the company’s analytic team that target particular problems. “We have done analyses throughout the world on very specific questions,” Wegryn says, “like what is the proper balance between capacity at a particular plant and the inventory it should be holding, to help responsiveness to our customers.”

Whatever the application, his team collaborates closely with members of P&G’s IT team — the company’s Global Business Services unit has several hundred employees operating in analytics alone — in order to get the answers to many of P&G’s problems. Says Wegryn: “We develop the algorithms and mathematics inside, but as far as database and systems architecture and deployment and support, we defer to our IT colleagues.”

In the 23 years since she joined Big Blue, IBM’s Dietrich has seen OR evolve “from data gathering that took months and months” to OR available on the desktop. “We can now deliver to executives software that, with a click of a button, can run models and present results. But it takes work to get OR embedded in daily business, and it takes people who can present OR to executives in a concrete way. The bottleneck in OR today is people — the industry is short on people who can deploy OR and frame it in a business context.”

And that is what gives Wegryn his unique status at P&G: He can talk business, and his business counterparts listen. “Rarely are we walking in front of a senior manager without any in-business support for the work we’ve been doing,” he says. “We go off, we analyze options, we come up with a recommended plan, and then we present that to management. Do they throw us out of the office for screwball ideas? The short answer is no. We’ve developed a reputation of having an unbiased view of how the business operates, and we’ve earned their trust.”

Additional reporting by Jake Swearingen.

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