THE WINNERS AND THE ALSO-RANS

Why do some companies become industry leaders, while others never rise to the top? For example:

- McDonald's versus Roy Rogers
- Walmart versus Kmart
- Marriott versus Howard Johnson's
- Google versus Yahoo!
- UPS versus Airborne Express
- Amazon versus Borders

What has McDonald's discovered about cooking burgers and fries that has eluded Roy Rogers? Why are Walmart's aisles bustling with customers, while at Kmart even Blue Light Specials can't fill the stores? Why, after more than 50 years as close competitors, did HoJo become history and Marriott a megachain? Why does Google appear on the verge of putting Yahoo! into the dustbin of history? When you must get a package delivered on time, why do you dial up the "tightest ship in the shipping business" instead of Airborne Express? And why has Amazon managed to leave a host of venerable, already established booksellers at the starting gate?

Theories abound about the drivers of industry dominance: strategy, leadership, sticking to the knitting, customer centricity—the list goes on and on. While these theories may go far in explaining why some companies rise to the top, they just do not go far enough.

Take McDonald's. Underlying the Big Macs, Egg McMuffins, french fries, and now first-rate coffee, there is a hidden advantage: McDonald's remarkable consistency. Visit just about any McDonald's restaurant: from burgers to bathrooms, from coffee to counter service, you know what to expect and you get it. Or look at Walmart. Not too long ago, the pundits were predicting the demise of the general merchandise stores that had become part of the post-World War II business landscape. Indeed, Montgomery Ward, Sears, J.C. Penney, Kmart, and others have either fallen off the charts or appear to be hemorrhaging uncontrollably. Walmart, on the other hand, weathered the most recent economic downturn quite handily, remaining profitable while so many others in its industry were gasping for air.

In yet another industry, consider Google. It certainly did not invent the Internet search engine. In fact, Google was a relatively late bloomer that suddenly burst on the scene in 1998, two or three years after a host of other search engines—Lycos, AltaVista, InfoSeek, and Yahoo!—were already up and running. And then there is Amazon. It has left every other online mall in its wake, with revenues more than double that of its closest rival.

How do you account for the difference between these stars and the also-rans? Is there a common denominator that differentiates them from other companies? There are undoubtedly a number of reasons for their stellar performance, but one that has largely gone unnoticed is this: these companies possess an uncanny *ability to make complex decisions faster, more accurately, and more consistently than their competition*.

Optimizing Decision Making: The Competitive Edge

In today's fiercely competitive world, the notions of long-term strategy and enduring competitive advantage seem like quaint anachronisms, part of the detritus of the 1980s and 1990s. Now, "strategy on the run" and tactical advantage rule the day. McDonald's, Walmart, Marriott, Google, UPS, Amazon, and many others have demonstrated

that competitive advantage comes from tight focus and riveting attention on making optimal decisions that squeeze every ounce of value from the assets under management. As we will see, *Optimization is a decision-making process and a set of related tools that employ mathematics, algorithms, and computer software not only to sort and organize data, but to use that data to make recommendations faster and better than humans can.*

The McDominator

McDonald's vaunted mastery of consistent, cost-conscious quality is a tribute to its laserlike focus on hundreds of microdecisions made by employees every day, all over the world: when to turn hamburgers and dump old coffee; how often to fry a new batch of chicken McNuggets and how many to fry; how many times a day to clean bathrooms. These decisions have been translated into rules that govern the behavior of McDonald's employees. The rules are deceptively easy to follow, but many factors have to be considered in order to make the right decisions for each individual restaurant: location, season, weather, day of week, time of day, customer preferences, projected volume, and on and on. Then just the right balance must be struck between turning hamburgers and turning a profit. Mickey D's learned early on that the best way to ensure the quality of its decisions was to introduce Optimization and build a strong culture to support it. It obviously worked: in 2008, when the U.S. stock market lost two-thirds of its value, McDonald's was one of only two companies among the Dow Industrials whose stock actually *gained value*. Which was the other? You guessed it: Walmart—another big user of Optimization.[1]

Everyday High Profits at Walmart

Walmart supplies a wide array of decent goods, all at reasonable prices. How does the megachain do it? Volume buying helps, but it is not the real differentiator. What makes Walmart unique is its command of logistics. It continually deconstructs its entire supply chain, from supplier to distribution centers to customers, and treats each link as a decision point, asking a battery of microquestions: Where and how much to buy and at what price? Where to route goods? How to resupply and reorder? It optimizes assets all along the supply chain, decision by decision. Its obsession with squeezing value from every

link in the chain has enabled it to develop *smart rules* for making decisions and managing its business.

Take air conditioners, a relatively mundane product in today's high-tech world. Many of Walmart's competitors, like Kmart, tend to use simple rules to regulate their stock: "In the summer, make sure that every store has lots of air conditioners" or "Stockpile air conditioners for our mid-August sale." Not Walmart, where the management of air conditioners and every other asset is guided by optimization decisions, which employ *smart rules*, such as: "In the summer, track the weather; find out where heat waves are predicted; and be prepared at a moment's notice to redirect air conditioner shipments to the areas with highest demand."

As a result of its optimization prowess, Walmart—which was originally created by Sam Walton to serve rural areas too small for Kmart to bother about—has driven Kmart to the brink of extinction.

The Price Is Right at Marriott

For decades, Howard Deering Johnson and J. Williard "Bill" Marriott appeared to be moving in parallel universes. In 1925, Johnson borrowed $2,000 to buy a small drugstore in Wollaston, Massachusetts; two years later, Marriott borrowed $6,000 to open a nine-stool A&W root beer stand in Washington, D.C. By 1937, Johnson had established, through franchising, 56 Howard Johnson's restaurants that graced the nation's expanding highway system with their distinctive orange cupolas and 28 flavors of ice cream.[2] Marriott's small root beer stand initially grew into eight Hot Shoppes restaurants along the Washington-Baltimore corridor,[3] and by 1938 the company was supplying box lunches to passengers on Eastern Air Transport's 22 daily flights from Washington to New York. Each company opened its first travel lodge in the mid-1950s and for a decade competed in serving travelers on the country's new interstate highway system. The 1960s and early 1970s were boom years for both Howard Johnson's and Hot Shoppes, which changed its name to Marriott in 1967.

The companies' paths, however, soon diverged. As changing public taste, tougher economic times, and soaring fuel costs caused Americans to cut back on vacations and long drives, Howard Johnson's

profits sagged. Like many executives before and since, Johnson and his executive team chose to respond by downsizing, but their efforts to cut costs, reduce the number of employees, and serve cheaper food only accelerated the public's flight from HoJo's doors. Finally, in 1979, the chain accepted an acquisition bid from the Imperial Group PLC of Britain for all of its 1,040 restaurants and 520 motor lodges.

Meanwhile, Marriott was meeting the same challenges in a different way: optimizing rather than downsizing. It moved aggressively first into international property management—opening the company's first European hotel in Amsterdam, Holland, in 1975—and in 1982 into the then-lucrative time-share market. As its properties and assets grew, Marriott took one additional important step to strengthen its competitiveness. As a longtime partner of the airlines, Marriott had a front-row seat as the industry turned to mathematical algorithms and optimization software to make minute-by-minute price adjustments to maximize plane loads. It soon became the first company in the hospitality industry to adopt the airlines' "revenue management" pricing techniques.

The end of the story? In 1985, Marriott purchased Howard Johnson's assets from the Imperial Group, subsequently selling them to Prime Motor Inns.

Google: Master of the Search

Then there's Google. In 1992 there were only 26 websites; eight years later that number had soared to one billion; another eight years later Google's new content links registered one trillion unique page links.[4] A prodigious rate of "inventory" expansion, indeed! Recent estimates of the number of Google customers are difficult to find, but a study conducted in late 2008 reported that Google had registered 7.23 billion search requests that year, or approximately 10 million search requests per hour.[5] Google's challenge involves nothing less than deciding in seconds, for each request, which of the trillion pages are most relevant. What is Google's secret, and how has it come to dominate Internet search so completely? Quite simply, Google out-optimized its competitors. It found a way for its computers to make decisions more quickly and accurately than everyone else. In 1998,

when two Stanford graduate students founded Google, Yahoo! had a four-year head start. Yahoo!'s approach to optimizing searches involved hiring experts to grade websites for relevance. The approach worked well for 26 websites—and maybe even for a million. But for a trillion? There just weren't enough experts!

Google, in contrast, thought like an optimizer and in the process invented a new model. Rather than use experts, Google discovered that it could leverage its customers themselves! Google could track how often a given Web page was referenced, or linked to, by other Web pages. This allowed Google to build its now-famous PageRank algorithm. The pages most frequently referenced for a particular topic became the most relevant sites. No paid experts need apply to Google. The decision algorithm that Google developed not only surpassed Yahoo!'s panel of experts in providing relevant content, it proved capable of searching through a trillion pages as many as 10 million times an hour. For a period of time, Yahoo! actually retained Google to do its index searches, before realizing that the decision-making optimized search engine was the core competency that would propel the winner across the finish line. Google stands as the quintessential decision optimizer. Its competitors have simply not been able to keep up.

UPS Takes the Right Turn

Although not quite as old as UPS, Airborne Express's history stretched back to 1946. The company had developed a U.S. air-and-ground express-delivery service, as well as business logistics services much like those of UPS. However, in August 2003, Airborne's shareholders approved the sale of the company to Belgium-based package-delivery service DHL. Five years later—in the face of stiff competition and a declining economy—DHL shuttered Airborne Express's U.S. delivery operation.

While the ink was drying on Airborne's sale to DHL, UPS was pondering how it could increase the fuel efficiency of its delivery trucks. With a fleet of 88,000 trucks, even small savings could be leveraged across the fleet, adding up to major economies company wide. One area of waste that UPS identified was the time its trucks spent

idling while waiting to make left-hand turns. UPS's response: optimization routing software that favored right-hand turns. By developing routes that balanced directness with the fewest possible left-hand turns, in 2005 the software helped UPS eliminate 464,000 driving miles in Washington, D.C., alone, saving 51,000 gallons of fuel.[6] The competition and economic downturn proved no match for the "tightest ship in the shipping business."

Rewriting the Book at Amazon

Amazon is to the Internet what Walmart is to bricks and mortar. Not only were its revenues more than double that of its closest Internet rival in 2009, but the gap is widening. During 2009, Amazon's North American Web sales grew by 25 percent, while U.S. online retail as a whole grew by just 6 percent. How does this Web behemoth do it? It wasn't the first Internet retailer; it wasn't even the first cyberspace bookseller. But Amazon optimized better than its competitors—at both its front and its back doors.

At the front of its electronic store, Amazon's Web servers send out millions of personalized recommendations to customers each day, informing them of new and used items that closely match their personal interest. Over the years, Amazon has become so adept at managing its Web portal that competitors like Borders have outsourced the management of their websites to Amazon. In May 2008, in an effort to regain control of its Web sales, Borders launched its own e-commerce engine. The result? While at the height of a recession Amazon reported its "best Christmas ever" in 2008—with spending per customer growing by 18 percent—Borders reported an 11.7 percent decline in 2008 holiday sales on its new, non-Amazon website.[7]

Now consider Amazon's back door. When it opened for business 14 years ago, Amazon shipped just *a few items a day* out its back door—so few, in fact, that employees rang a small bell to celebrate each sale. By December 2008, at the height of the global recession, Amazon was selling *72.9 items a second.* If you stacked the copies of the bestseller *Breaking Dawn* that Amazon sold during the 2008 holiday season, they would reach the peak of Mount Everest eight times over! When you stop to consider that orders are typically filled and shipped one book

at a time, the magnitude of the accomplishment is astounding and undoubtedly keeps competitors awake at night.[8]

Reinventing Decision Making

The importance of effective decision making in business has not gone unnoticed. A quick search—using Google, of course—of "methods for making complex decisions in business" returns a well-prioritized list of 26,200,000 Web pages. A number of consulting firms have made a good living offering structured decision-making approaches to companies around the world. Nobel laureate Daniel Kahneman—after a long and illustrious career studying the foibles of human judgment and decision making—has argued that decisions are an organization's most important product and that companies should begin applying quality-control processes to decision making.[9]

While interest in business decision making is not new, there is a powerful new decision-making capability available: one that has largely gone unnoticed despite its success in vaulting a number of companies from bit players to industry powerhouses in relatively short order. That capability is Optimization, and it is increasingly playing a pivotal role in separating winners from the rest of the pack.

Optimization has been around, in various forms, for some time. Originally growing out of a discipline labeled "Operations Research," or OR, it began as an academic discipline and then—as we will see in Chapter 2—became a key factor in the Allied victory in World War II. After the war, Optimization was deployed to help manage large-scale, asset-intensive operations such as oil refineries, power plants, and the U.S. space program. As the availability, speed, and capacity of computers increased in the last decades of the 20th century, optimized decision making moved from the public to the private sector and was soon adopted by both larger and smaller enterprises in a variety of industries.

Optimization is known by different names in different communities: to the computer scientist it is artificial intelligence; to economists it is modeling; mathematicians know it as game theory or applied mathematics; engineers, with a nod toward tradition, have stuck with Operations Research. Most recently, it has been referred to in some

business circles as advanced analytics. What is common to all of these groups when they speak of Optimization is that each is typically referring to large *data sets*, *decision algorithms*, and an *empirical approach* to deciding what works best. Computers and sophisticated software are being used to make increasingly complex decisions more quickly and accurately. When effectively applied, Optimization can become a competitive game changer, as it has for many companies, including computer-chip maker Intel, which is featured in the accompanying sidebar. If your organization is not using Optimization, it may be strategically vulnerable. Chances are that one of your competitors has already tapped the power of Optimization.

OPTIMIZING FOR INNOVATION AT INTEL

Continuous innovation is what keeps Intel at the top of the semiconductor industry, and that innovation comes from the company's most important asset: its people. To maximize their contributions, Intel must carefully assemble product-design teams with just the right mix of circuit engineering, software development, and system validation skills, to mention just a few.

The teams in any product-design group may be working on dozens of major development projects at any one time, each employing hundreds of highly skilled individuals spread across multiple geographies. The status and priorities of these projects are in constant flux. The result is a recurring cycle of assignments and reassignments guaranteed to keep project managers awake long into the night.

For many years, team assignments and reassignments were made using large, group-specific spreadsheets. Juggling the personnel could take a full day or more. Worse still, the resulting solution often involved moving more people among teams than necessary, costing time, money, morale, and—a game stopper for Intel—creativity.

When one product-design group asked Karl Kempf and his team of optimizers from the Decision Engineering (DE) group to improve its personnel-assignment process, the team set about developing a

decision-support software program. Inputs included everything from skill requirements to projected completion dates to individual location preferences. The program even took into account hiring projections. The output: an optimal personnel-assignment plan matching personnel and projects over an extended time period. A user-friendly graphical interface clearly identified trouble spots such as under-resourced projects or underutilized talent. It also allowed planners to test alternative assignments in what-if scenarios.

When the Resource Planning Tool, as it was dubbed, was introduced, it reduced the time needed to make assignments and reassignments from more than a day to less than an hour. Equally important, the computer-generated solutions invariably moved fewer people, thereby creating tremendous cost savings while helping to sustain creativity. The decision tool was so successful that other product-design groups immediately began asking for it.

Within 18 months, all product-design groups at Intel were using the tool, drastically cutting workforce planning time and saving multiple person-years of effort per year. When fully deployed, the Resource Planning Tool made it possible to roll individual team plans up to top managers, allowing them to make superior product-design resourcing decisions across the organization.[10]

The Institute for Operations Research and the Management Sciences (INFORMS) is the largest professional society in the world for professionals in the field of Operations Research, or Optimization. Its annual Edelman Award recognizes outstanding, money-earning examples of the application of these techniques. A glance at the award finalists since 2005 illustrates the increased emphasis being placed on Optimization by industry leaders. Among others, the finalists have included HP, IBM, Marriott International, Coca Cola, P&G, Swift & Co., Eli Lilly & Co., Zara, and the Memorial Sloan-Kettering Cancer Center. The INFORMS Roundtable, an optimization interest group, counts among its members AT&T, Bank of America, Boeing, Cisco, FedEx, GE, HP, IBM, Intel, McDonald's, P&G, Verizon, and Walt Disney: all companies working on improving their competitive position by optimizing decisions.

Every Executive a Quant?

The physicists, mathematicians, psychologists, engineers, and computer programmers who crunch numbers, develop decision algorithms, and write optimization software are commonly known as "quants" (short for *quantitative analysts*). If you are an executive exploring whether or not Optimization will help your company raise its level of competitive play, I don't advise running out to sign up for a crash course in advanced mathematics. There's no need for you to become a quant, but it would help to think a bit like one.

Begin by asking a few optimization questions, such as:

• **What are my company's underutilized assets?** For example, for a newspaper, it might be ad space; for a pharmaceutical company, it might be the "face time" that sales reps spend with doctors; for an agricultural company, arable land or available seeds might be the undervalued asset; for a railroad, train capacity might qualify. Which of your assets, if tapped for optimal value, have the potential to take your organization to a significant new level?

• **Where and how are repetitive decisions about key assets being made in my company?** Assume you could improve the accuracy of these decisions by 10 percent—or perhaps make them twice as fast. What would be the potential impact on profitability, customer service, or sales?

• **When and how are we forecasting? How accurate are our forecasts?** What would be the impact on your competitive position if the accuracy of these forecasts could be improved by 10 percent—or if they could be derived one month earlier?

• **Where are we repeatedly having lengthy debates over strategic decisions or operational issues?** Can you collect better data upon which to base these decisions? Could you make these decisions more empirically, rather than relying so heavily on the "three Hs": **h**istory—"It's the way we've always done it," **h**unches—"It feels right," and **h**ierarchy—"Because I say so, and I'm the boss."

• **What does "best" mean?** The next time you hear someone in your organization say, "This is the 'best' decision," ask what factors constitute *best*: cost savings, service, profitability, speed of resolution, capacity utilization? Are these factors the right ones, and are they carrying the right amount of weight in the decision process?

Final Note

The Optimization Edge examines optimized decision making from multiple perspectives:

1. Part 1 continues with Chapters 2 and 3.
   - Chapter 2 will take you on a brief historical tour of Optimization to help you better understand what it involves, where it came from, and a bit about where it seems to be heading.
   - Chapter 3 will put you inside a variety of companies and industries to learn how decision optimization is being used for competitive advantage in applications as far-ranging as getting greater yield from print ads to scheduling airplanes to predicting hit songs.
2. Part 2 will take you, step-by-step, through a proven process for successfully implementing Optimization in any organization.
   - First, Chapter 4 will compare Optimization to other decision-making approaches and to other popular organizational-improvement initiatives. It will explore some of the reasons that people resist adopting Optimization and why it is often underutilized. Finally, Chapter 4 will provide you with a set of questions that you can use to evaluate your company's preparedness to undertake an optimization project.
   - Also in Part 2, Chapter 5 will discuss the differences between *good* and *great* optimization projects and will introduce Princeton Consultants' five-step process for successfully executing an optimization project. Chapter 5 will take you through the first two steps of the process—the charter and the vision—using examples from real-life companies as illustrations.
   - Chapter 6, the final chapter in Part 2, will explore the remaining three steps of our company's process: the early win, the scale-up, and the harvest.
3. In Part 3, we will look over the horizon to trace the future of Optimization. Chapter 7 will include a discussion of the vast potential of Optimization as well as some of the challenges that could possibly slow its implementation.