I N 1693, OVER A DECADE BEFORE HE PREDICTED the appearance of a comet that still carries his name, Edmond Halley used population data to create a life table. It was, essentially, a formula that predicted how long someone would live and, therefore, what the price of their government-sponsored annuity should be.

It was one of the world's earliest predictive models, generating recommendations powered by pen, paper and a slew of manual computations that a modern mathematician described as "quite tedious."

Predictive models still forecast life expectancy and price insurance policies today, but otherwise bear scant resemblance to their 17th century ancestor.

Today's models are digital and automated, translating terabytes of data into real-time predictions and recommendations. Leading businesses in most every industry have embedded these models into their operations, with some seeing billions of dollars added to their bottom lines as a result.

"Models are the currency, the ammunition, that's going to separate the next generation of winners and losers in business," says Nick Elprin, CEO of Domino Data Lab, a company whose software allows busi-

"If Data Is Like Oil, Then
PREDICTIVE MODELS
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nesses to build, test and deploy their own predictive models at scale. "And the truth is, predictive models are already creating that separation."

Predictive models power the suggestions that pop up as you search for shows on Netflix or as you check out on Amazon; they update the routes of your Uber or Lyft rides. Maersk, the world's largest container shipping company, is applying models to make its global operations and supply chains more efficient, while Coca-Cola uses models to analyze how factors such as weather patterns and crop yields will affect the profitability of certain orange juice recipes.

Bryan Schreier, a partner at Sequoia Capital and Director at Domino Data Lab, noted in a Forbes op-ed that, "the CEOs of Applied Materials, Dropbox,

Electronic Arts, Tencent and Vodafone all extolled the virtues of data science models" in 2018 earnings calls. Mr. Schreier's message to other CEOs: "model or die."

Yet for all their power and unrealized potential, predictive models are still widely misunderstood, often spoken of as if synonymous with a handful of other tech terms: machine learning, data science, AI, software and data.

Predictive models are special kinds of algorithms that use data to generate predictions – like how long somebody will live – or recommendations – like how much an annuity should cost. These models are built by data scientists, and often powered by artificial intelligence and machine learning. So while predictive models use software and data, "they're fundamentally different from software or data, and they need to be thought of and managed differently as well," says Mr. Elprin, who holds both an undergraduate and

Domino Data Lab CEO **NICK ELPRIN** speaks with Brunswick's **SHAHED LARSON.**

Master's degree from Harvard in computer science.

A Domino Data Lab whitepaper used the metaphor: "If data is like oil, then models are like engines. Models make things happen. They initiate action. They can predict things before they happen more accurately than humans." Earlier this year, Steve Cohen, founder and CEO of the quantitative hedge fund Point72, wrote a Wall Street Journal op-ed with Domino co-founder Matthew Granade, in which the pair went a step further, arguing that "models will run the world."

Mr. Elprin co-founded Domino Data Lab with Chris Yang and Matthew Granade in 2013, after nearly a decade building tools and technology for quantitative investors at Bridgewater Associates. The young company has offices in Chicago, San Francisco, Bengaluru, New York and London, and its clients include Tesla, Dell, Allstate and Gap. After a recent $40 million round of Series D funding led by venture capital titan Sequoia and the tech-focused hedge fund Coatue Management, the privately held Domino has been valued at more than $250 million.

At Domino's San Francisco office, Brunswick's Shahed Larson spoke with Mr. Elprin about the threat that predictive models pose to companies that fail to embed them, and he explained why managing these models is an "organizational capability," not simply a technical skill.

Another topic that arose: how often Domino Data Lab is confused with the American pizza chain Domino's. "It doesn't happen as often as you'd expect," Mr. Elprin said. "Maybe once every few months. Though we did have one support ticket asking how long it would take us to prepare a large order."

Just how difficult is it to convey the importance of predictive models to leaders who don't fully understand the technology?
With executives, I focus on the existential threat they're facing if they don't find a way to become model-driven; by "model-driven" I mean getting predictive models running the core parts of their business, automating more of the decisions being made.

You look at Netflix, which has this amazing recommendation model that its executives have said is worth more than $1 billion a year. Or Amazon, where Jeff Bezos wrote in his 2016 shareholder letter that machine learning has been powering thousands of processes and decisions they make across their business, everything from fraud to product recommendations to inventory management.

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What about leaders who say, "That's great for them, but we're not a tech company?"
Most of our customers aren't actually tech companies. Allstate is a customer, for instance. The whole insurance industry is based around predicting the probability that someone you're insuring is going to file claims; if you can use models to better do that, you're going to become more profitable.

Some insurance firms are also using models to improve customer experience. If you get into a car accident, for example, you can take a picture of the damage on your phone, submit it and have a model predict the damage instead of waiting for a claims adjustor to come out into the field. That obviously saves money for the insurance company and saves time for the customer.

Monsanto is another customer of ours and they're using models to better predict which new seed types and crop strains will be most effective. They're also building field-plotting models for farmers, which recommend the best places to plant crops, looking at factors like soil composition, field topology and weather patterns.

To give you just one other example: A lead scientist at Bristol-Myers Squibb, another client, talked recently at our annual event, Rev, about applying data science for immunotherapy research they're doing for cancer treatment, and how they discover new correlates between immune cells and cancer genetics to drive immunotherapy breakthroughs.

So it's happening everywhere. It's not just tech companies. We have entered the next era of computing. If you aren't figuring out how to put models at the heart of your business, you're going to get surpassed by competitors who are.

And if you want to turn yourself into a model-driven business, you need to think about building that as an organizational capability.

An organizational capability?
Absolutely. Changes across people, process, and technology. A big misconception is you can hire data scientists, give them access to data and then all of a sudden you'll build great models to run your business.

During the e-commerce wave, it wasn't enough for a company to hire people with the title of webmaster and think, "Now we're an e-commerce business." You had to fundamentally rewire and reorganize how the business worked. Webmasters were a necessary ingredient, but by themselves they were nowhere near enough.

That's the same kind of thinking needed for predictive models: Finding ways to get different parts of

the business working together and aligned on how to put predictive models at the heart of the work that is being done.

But can software solve an organizational problem of that size?
Think of other organizational capabilities – sales, marketing, HR. To handle those capabilities at scale, you need a product that records all the work being done, that allows people to share information, to collaborate. A sales organization can't scale without a CRM [customer relationship management] tool like Salesforce.

Software like that helps ensure people are reusing each other's work instead of wasting time reinventing the wheel; it lessens key-person risk.

Predictive models need the same organization-wide focus and tools. If three data scientists leave, do you lose all their work, or can other people pick up and start working on it again? Are people able to build on work that's already being done? Are people from four different offices able to collaborate on the same projects, share lessons?

What types of problems will predictive models be tackling in the next decade?
There's an irony asking me to make predictions based on gut instincts and intuition. [Laughs]

What's state of the art when it comes to computing power, what algorithms and models are being used for – it's all moving so fast that it's tough to speculate. But I think in five years – and it's already happening in some cases – businesses will view models as their core intellectual property. They'll be what the executive suite and CEOs want to have cataloged and indexed. They'll be asking, "Which of these models are driving how much value?" or "Which of these models have been updated most recently?"

You're seeing some of that already?
Absolutely. Especially in some of the financial services and asset management firms. The models used to make investment decisions and recommendations are the engines of those businesses – there's no way to manage the business without managing the models. The models are what create value.

Do you remember the first model that you built?
I'm pretty sure it was during high school. I was taking a class on environmental science. I built a little predictive app that would look at things like where you lived, the size of your house, and would predict your energy bill. It was pretty basic.

"A BIG MISCONCEPTION IS YOU CAN HIRE DATA SCIENTISTS, GIVE THEM ACCESS TO DATA, AND THEN ALL OF A SUDDEN YOU'LL BUILD GREAT MODELS TO RUN YOUR BUSINESS."

What could business leaders do today to help their companies become more model-driven?
I don't know if there's one universal quick win. But there is a way to figure out what the quick win is for your company: Get your executive team together and have them define their priorities, then bring in someone with a data science background. Make it a real, collaborative conversation. Give the data science team a mandate, challenge them to find some way of attacking one of these in a certain time frame, as opposed to going off and doing a moonshot project that could take two years and who knows if it'll pay off or not.

Has your experience been that the age-stereotype holds true: older executives are more skeptical of, or resistant to, models?
I haven't seen that. Maybe there's a selection bias; we're generally talking to CEOs who appreciate the importance of the technology to their business. Now, whether they understand exactly what the details are and how to operationalize it – that varies.

But I don't have experience with executives who are that caricature of, "What are these computers?" [Laughs]

Are people resistant to the idea of models replacing human intuition?
In some cases. There's definitely a perception that people whose job it is to make decisions will have their authority taken away from them. I'm not talking about the "robots taking all our jobs" dystopia, but imagine you're a claims analyst and there's a proposal that a model is going to determine whether a claim is fraudulent or not.

A great approach we've seen is for companies to gradually phase into a model-driven approach. Initially, they may use models to make a recommendation to the human – but it's still the human's call.

Over time, that lets the organization build confidence. How is the model doing? Is it doing the same things the human would do? Is it performing better? Worse? If it's faring worse, then they ask the employee: "What did we miss in building the model? What do we need to add?" Employees feel like their expertise is valuable; they're helping to guide the development of the model.

And then, over time, everyone gets comfortable with becoming model-driven. ◆

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