

Machine Learning: The New Proving Ground for Competitive Advantage

A recent survey conducted by MIT Technology Review Custom and Google Cloud reveals that while the majority of businesses are struggling to apply machine learning, others are hard at work developing strategies for the technology — and are already realizing genuine ROI.

Executive Summary

The business world's focus on machine learning (ML) may seem like an overnight development, but the buzz around this technology has been steadily growing since the early days of big data.

ML is beginning to deliver on the potential created by big data and analytics by turning raw data into useful, predictive tools for business. Innovation-minded business leaders are embracing ML as “the next big thing” and have already crafted ML strategies and initiatives that promise real benefits and return on investment (ROI).

The survey sought to reveal where organizations stand in terms of adopting ML strategies. Respondents included current ML strategists, representatives from companies planning to execute ML initiatives in the next months or years, and those with no ML plans for the foreseeable future.

Several key themes emerged from an analysis of the survey results:

- **ML is happening now.** The majority of respondents (60 percent) have already implemented ML strategies, and nearly one-third considered themselves to be at a mature stage with their initiatives.
- **ML provides marketplace advantage.** According to respondents, a key benefit of ML is the ability to gain a competitive edge, and 26 percent of current ML implementers felt they had already achieved that goal.
- **Organizations are investing in ML.** Among current ML implementers, some 26 percent reported that more than 15 percent of their IT budgets was dedicated to ML initiatives.
- **Early adopters are realizing ML's biggest potential benefits.** The top hoped for benefit among ML implementers and planners is the ability to extend data analysis efforts and increase data insights. Some 45 percent of respondents report success in meeting that goal. In addition, more than half of both early-stage and mature-stage users say their ML efforts have resulted in demonstrable return on investment (ROI).
- **ML implementers are pursuing a broad range of projects.** The most common projects among current ML implementers are image recognition, classification, and tagging (47 percent); emotion/behavior analysis (47 percent); text classification and mining (47 percent); and natural language processing, or NLP (45 percent).

The speed with which respondents are able to demonstrate ROI with their ML initiatives is also notable, which, as mentioned earlier, was not the case with big data analytics. Within the early-stage group, more than half report they are beginning to see a demonstrable ROI, and within the mature-stage group, more than half had demonstrated ROI.

Survey Methodology and Demographics

The survey was conducted online in late 2016. The 375 qualified respondents represented a variety of industries, with the preponderance coming from the technology industry (43 percent), but also from other segments, including business services (13 percent) and financial services (10 percent). Company sizes range from very small (one-person shops) to large (more than 3,000 employees). Almost half (48 percent) of respondents come from organizations with fewer than 50 staffers; almost one-quarter (22 percent) are from companies of 50 to 1,000 employees. Just under a third (32 percent) comes from companies with more than 1,000 employees; of these larger organizations, nearly three-quarters are from businesses employing more than 3,000 people.

While the survey was global, the largest percentage of respondents came from the United States and Canada (40 percent), Europe (13 percent), India (6 percent) and the U.K. (5 percent), with the rest divided between more than 25 other countries. Most qualified respondents were either C-level executives (39 percent) or enterprise developers (37 percent), rounded out by vice president-level executives (23 percent). Of the C-level participants, most were CEO, president, or chairman of their companies (17 percent), while others headed up IT or technology organizations (11 percent), the analytics function (9 percent), or the security team (2 percent). VPs, meanwhile, were from business functions (8 percent), IT (7 percent), or analytics/data (8 percent).

In terms of technology adoption, nearly half the respondents considered their company cultures to be innovation-driven, with “agile, collaborative, even groundbreaking” cultures (45 percent). Twenty-two percent described their organizations as “believers”—that is, quick to adapt new technologies, but still awaiting overall transformation. Another 22 percent viewed their businesses as “agnostic”—interested in learning about new technologies, but cautious about actually making changes, and the remaining 11 percent considered themselves “traditionalists,” generally risk-averse and more apt to use standard, well-established technologies.

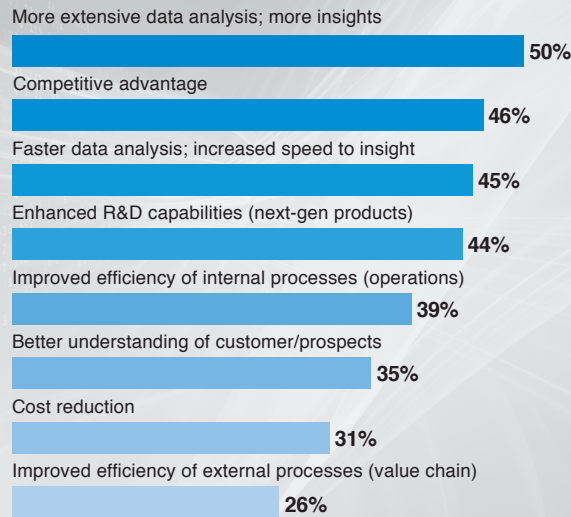
The benefits

expected by machine learning (ML) planners differ from those of current ML implementers in one regard: the former strongly believe they will also gain a better understanding of customer and prospect behaviors, needs, and desires, with 50 percent of ML planners citing this expectation, compared with just 35 percent of current ML implementers.

Q9: If your organization is currently using ML, what are you *seeking to gain*?*

50%

ML users say they are seeking more data analysis and insight



*Multiple responses allowed. All percentages have been rounded.

Analytics and Big Data Strategies

The survey opened by asking about current use of traditional online analytics processing business intelligence (APBI) and visualization tools, traditional big data technologies such as Hadoop and cloud-based analytics. In the vast majority of cases (95 percent), respondents either plan to implement an online analytics processing BI program or have already done so. The same percentage of participants also plans to implement big data technologies such as Hadoop, or have already executed on their plans. Meanwhile, nearly all participants (96 percent) had either implemented cloud-based analytics or planned to do so.

Few respondents, however, had measured the ROI on any of these analytics initiatives. Only 18 percent reported measuring ROI as part of their APBI initiatives, and even fewer did so for their big data technologies (14 percent) and cloud-based analytics programs (14 percent). That's not surprising, according to Philippe Poutonnet, global product marketing lead for Google Cloud Platform.

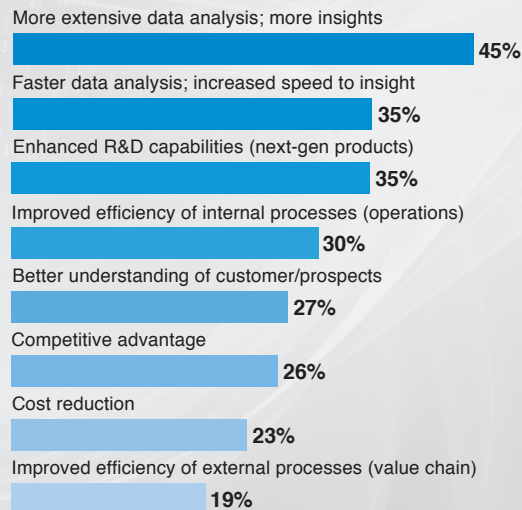
Establishing an ROI metric for such programs is difficult, he says. Some companies—particularly those whose business models rely on collecting and analyzing large data volumes—“just know they need to do big data analytics to provide a better customer experience and grow their revenue, and don't have time to develop a working ROI model.”

In many other cases, he says, companies don't realize ROI because the projects themselves don't succeed. “What the industry is seeing is that more than 50 percent of big data projects fail, and fail miserably,” Poutonnet says. “Businesses are spending a lot of time with the data-gathering and data-preparation phases, as well as trying to figure out the data architecture, and they don't have time to play with the data itself.”

Q10: If your organization is currently using ML, what have you *actually gained*?*

45%

ML adopters say the technology has led to more extensive data analysis and insights



*Multiple responses allowed. All percentages have been rounded.

Further, he says, running hundreds or thousands of queries to discover a pattern or insight can be extremely time-consuming. Even running a single query on traditional systems can take 30 minutes or longer to return—a time-consuming process that cloud-based machine learning can help to eliminate.

Moving to Machine Learning

A clear majority of respondents—60 percent—said they had already implemented an ML strategy and had committed to an ongoing investment in ML. Another 18 percent planned to implement an ML strategy in the next 12 to 24 months.

“Machine learning is basically a way for a computer to find the nuggets of information that a human can’t,” explains Fausto Ibarra, director of global product management for Google Cloud Platform. “Once you have your data and train and deploy your models, the machine can go through terabytes of data and get smarter and smarter—basically train itself—and ultimately make predictions for you.”

Take navigation app Waze, for example. Waze churns through data to recommend faster routes to drivers in milliseconds, based on real-time traffic data — an impossible task using traditional manual methods.

For one participant—a marketing director in a small U.S.-based technology firm—ML will be a “core tenet” of the business. For another, a C-level executive at a small healthcare-oriented software and services company in the United States, ML will be a “must-have going forward.”

Indeed, only 5 percent reported having no interest in ML and no plans to implement an ML strategy in the foreseeable future. Of this latter group, several voiced frustration that their organizations lacked ML awareness, support, or funding.

Top achieved benefit of current implementers of machine learning:

45%

cite increasing insights through more extensive data analysis

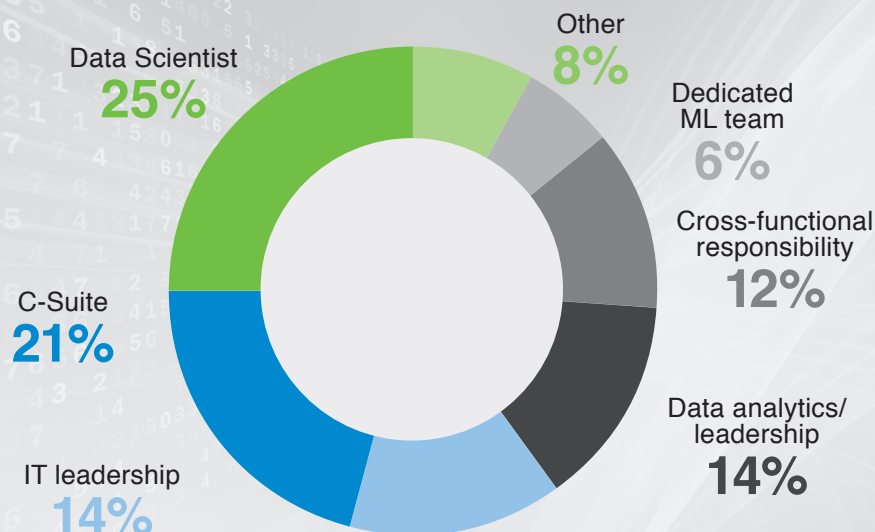
“We lack the understanding of potential positive implications” of ML, noted a respondent from a large U.K. investment firm. “Managers see only the risks.” Other participants said they simply didn’t understand how they could apply ML’s potential to their business. “I know it’s there; I just don’t know how to take advantage of it,” said one respondent, a C-level executive for a small manufacturing company in Mexico.

Clearly, however, a solid majority of respondents see the potential of ML and are moving forward with their ML plans. Of the 60 percent who had embarked on an ML strategy, about one-third (32 percent) were in the early stages of their strategies, testing either one or several ML use cases. Nearly the same percentage of participants (28 percent) described their ML strategy as “mature,” with between one and five ML use cases.

What is remarkable is the speed with which respondents are able to demonstrate ROI with their ML initiatives, which, as mentioned earlier, was the not the case with big data analytics. Within the early-stage group, more than half report they are beginning to see a demonstrable ROI, and within the mature-stage group, more than half had demonstrated ROI.

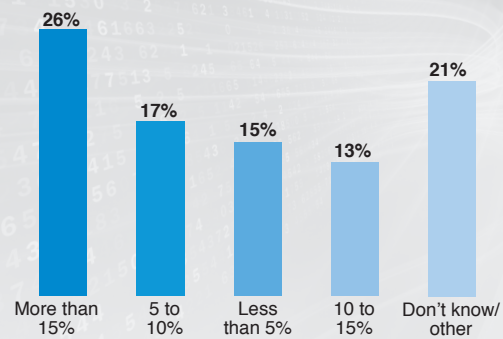
However, these findings may not be representative of the greater business world. While innovation-focused businesses, particularly those in the technology industry, may be further along in their ML strategies, Poutonnet notes that most companies are still unsure of how to approach ML. “Even those using the approach may have incomplete strategies or be in the earliest stages of adoption,” Poutonnet says. “It seems that everyone is racing to implement machine learning, but it’s not always clear how to get started.”

Q13: What function/department/role is the primary champion for your ML initiatives?*



*Current ML users, all percentages have been rounded

Q16: What part of your IT budget for 2017 is earmarked for ML?*



26%

Adopters report that more than 15% of IT budget is devoted to ML

*All percentages have been rounded.

Top Projects Among Current Implementers

In terms of the intended uses for ML, current ML implementers cited four top projects: natural language processing (NLP) (45 percent); text classification and mining (47 percent); emotion/behavior analysis (47 percent); and image recognition, classification, and tagging (47 percent).

Rounding out the top 10 most popular projects among current ML implementers were recommendations (42 percent), personalization (41 percent), data security (40 percent), risk analysis (41 percent), online search (41 percent), and localization and mapping (39 percent).

In the next year, attention among current ML implementers will shift toward automated agents/bots (42 percent of respondents), predictive planning (41 percent), sales and marketing targeting (37 percent), and smart assistants (37 percent), according to the results.

Top Projects Among Machine Learning Planners

The picture changes somewhat among respondents who had not yet implemented ML but planned to do so. While current implementers and planners share an interest in several project areas—particularly text classification and mining, NLP, and emotion/behavior analysis—ML planners are, obviously, somewhat behind current ML implementers.

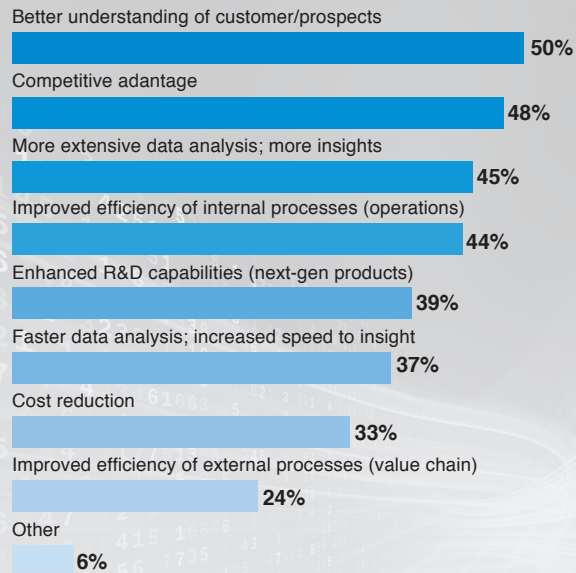
In the next year, for example, ML planners are looking toward recommendations (with 56 percent naming this as a likely ML project in the next year), text classification and mining (55 percent), NLP (52 percent), personalization (47 percent), emotion/behavior analysis (46 percent), and online search (41 percent). Current ML implementers, however, had already embarked on these initiatives, all of which appear on their current-year project list.

ML planners are also behind in ML projects involving data security (44 percent), localization and mapping (43 percent), and sales and marketing targeting (39

Q17: If your organization is planning to use ML, what benefits are you seeking?*

50%

Planners are seeking better understanding of customers and prospects as reason for ML



*Multiple responses allowed. All percentages have been rounded.

percent). All those ML initiatives are on the five-year horizon for ML planners, but are high on current ML implementers' list for next-year projects.

ML planners were more in sync with current ML implementers when it comes to three other items on their top-10 list for the next year: predictive planning (53 percent), automated bots (40 percent), and smart assistants (37 percent). All were also on the top-10 list for current ML implementers in the next-year timeframe.

One respondent, a C-level executive at a North American midsize construction company said the business planned to use ML for inventory and sales purposes. Another participant, a vice president of sales and operations planning at a U.S. consumer products company, said that his company is applying ML to demand/supply planning activities, as well as order processing.

That last respondent pointed out that many businesses use traditional material requirements planning (MRP) and enterprise resource planning (ERP) systems to automate these processes, and added: "We are seemingly always refining our reports to identify the most critical items to resolve. A lack of proper master data settings and other mismatches plague the process, and the best result comes from human beings checking and rechecking and following the most important items through the process." The work is highly manual, relying on planners pouring through e-mails with thousands of lines to decipher which items go unresolved to prevent stock-outs and supply disruptions.

With a ML application, the respondent continued, that work could be done by the system, and planners could react to exception messages sent from the application. "Human beings make a lot of mistakes in these jobs, and many of those are because of upstream issues that they didn't notice," the respondent noted. ML "could

26%

of those planning to implement machine learning report that champions are likely to come from the C-suite



“This is what is keeping business leaders awake at night: how to harvest and make sense of their data for competitive advantage.”

–Fausto Ibarra, director of global product management for Google Cloud Platform.

also aid in demand planning by looking for disconnects in the forecast relative to very recent history.”

Considering how quickly successful ML initiatives are able to return investment, it’s critical for planners to keep up momentum and strive to reduce implementation time.

Benefits for Current Implementers

Of all ML’s expected benefits, increasing insights through more extensive data analysis stands out as the one that current ML implementers were most interested in achieving (50 percent) or certain of having achieved (45 percent). “That’s the low-hanging fruit for everybody: taking data that’s unstructured—images, e-mail, product reviews, customer service calls—and making sense of it,” Poutonnet says.

In other cases, ML’s anticipated benefits didn’t necessarily align with what respondents actually realized from their ML strategies. ML implementers were somewhat less sure of having improved their R&D capabilities, including insights into creating next-generation products (44 percent expected this benefit, while 35 percent reported achieving it); increasing their data analysis speed (45 percent expected, and 35 percent achieved); or gaining internal process efficiencies (39 percent expected, and 30 percent achieved). This could represent a natural progression of the ML learning curve, as businesses are required to use ML techniques for which they may not have the skills in-house.

Benefits for Machine Learning Planners

The expectations for ML benefits were similar, in most cases, among current ML implementers and respondents who were still in the planning stages with their ML strategy: more extensive data analysis and increased number of insights (45 percent); faster data analysis and faster insights (37 percent); enhanced research and development capabilities, including insights into creating next-generation products (39 percent); and increased efficiency of internal processes (44 percent).

However, the benefits expected by ML planners differ from those of current ML implementers in one regard: The latter strongly believe they will also gain a better understanding of customer and prospect behaviors, needs and desires, with 50 percent of ML planners citing this expectation, compared with just 35 percent of current ML implementers.

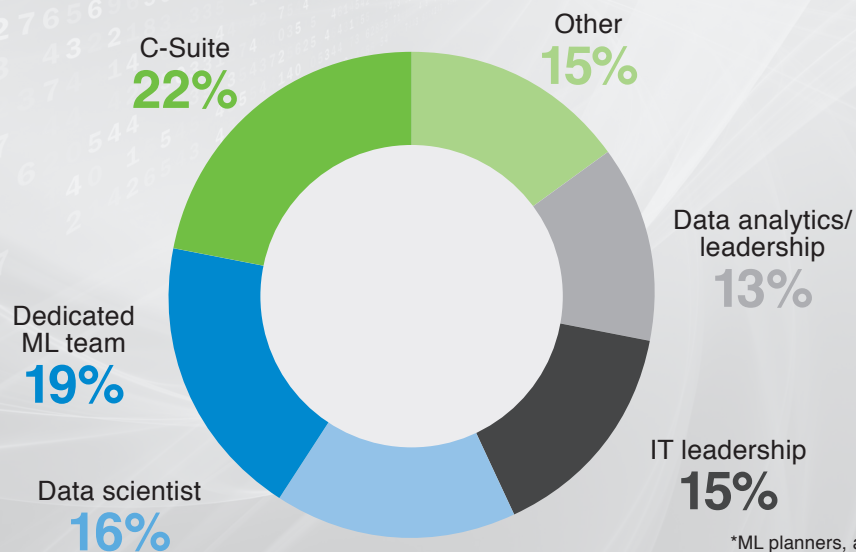
Another important note: both current ML implementers and planners agree that a key advantage of ML is the ability to gain a competitive edge, with 46 percent of the former group and 48 percent of the latter expressing this belief. Already, 26 percent of current ML implementers felt they had achieved that goal. “This is what is keeping business leaders awake at night: how to harvest and make sense of their data for competitive advantage,” says Ibarra. “Machine learning is allowing companies to surface the untapped value in their data.”

Machine Learning Budgets

The survey results suggest that ML will require substantial resources, and current ML implementers revealed their commitment to allocating the budget to an ongoing ML strategy. While about one-third of respondents (32 percent) said 10 percent or less of the IT budget was ear-marked for ML endeavors, somewhat fewer (26 percent) reported that more than 15 percent of the IT budget was dedicated to ML initiatives. An additional 13 percent said they had allocated 10 to 15 percent of the IT budget to ML.

Poutonnet recommends that a large portion of budgets be allocated to acquiring ML talent: “The potential in machine learning is enormous, and data scientists have the power to unlock it.”

Q20: What function/department/role will have primary responsibility for your ML initiatives?*



*ML planners, all percentages have been rounded

Leading the Machine Learning Charge

With the cost and complexities of ML, these initiatives require a champion who can communicate the vision of what ML can achieve and what it will take in terms of resources, skills and technologies to successfully implement it.

It's no surprise, then, that respondents reported that either the C-suite (21 percent) or a data scientist (25 percent) was most often the ML champion among current ML implementers. In fewer instances, a leader from IT (14 percent) or the data analytics team (14 percent) played this role, or it was assigned to a cross-functional team (12 percent). Very few participating organizations among current ML implementers—just 6 percent—had formed a dedicated ML team to take on this responsibility.

For ML planners, ML champions were even more likely to emanate from the C-suite (22 percent), and more of these respondents had formed a dedicated ML team among this group as well (19 percent). Data scientists were less apt to play this role (16 percent), and IT (15 percent) and data analytics leaders (13 percent) remained less likely to be the ML champion.

Looking Ahead

It's clear that ML early adopters are, or will, gain market advantage and rapidly move ahead of their peers who are hanging back. Even for those who haven't yet determined where ML belongs in their businesses and how to apply it, it's essential to keep an eye on this technology.

In most cases, these are still early days for ML, and many questions remain. But early adopters make it clear that business relevance and the ability to compete will increasingly hinge on working with machines to interpret and learn from data.

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