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Insights

Cloud adoption propels productivity growth and should be at the center of investment decisions.

Don't get left behind:
The business risk and cost of technology obsolescence

Preface

The focus of this research report, prepared by MIT Technology Review Insights in 2019, was to investigate the cost and risk to organizations that choose to stay on legacy systems, versus the benefits of organizations adopting a digital strategy powered by a modern, cloud-based platform. The analysis focused on three types of cost: business obsolescence, lost market share, and technological obsolescence.

The report describes the growing gap between companies using legacy systems, compared with those using emerging technologies delivered in the cloud, including machine learning, artificial intelligence, cognitive computing, internet of things, blockchain, and more. The report, which is sponsored by Oracle, is editorially independent, and the views expressed therein are those of MIT Technology Review Insights.

We would like to thank the following interviewees for generously sharing their expertise:

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Stuart Brown, Executive Vice President and CFO, Iron Mountain

Mike Fuller, Principal, The Hackett Group

Javier García Río, Head of Marketing, Mutua Madrid

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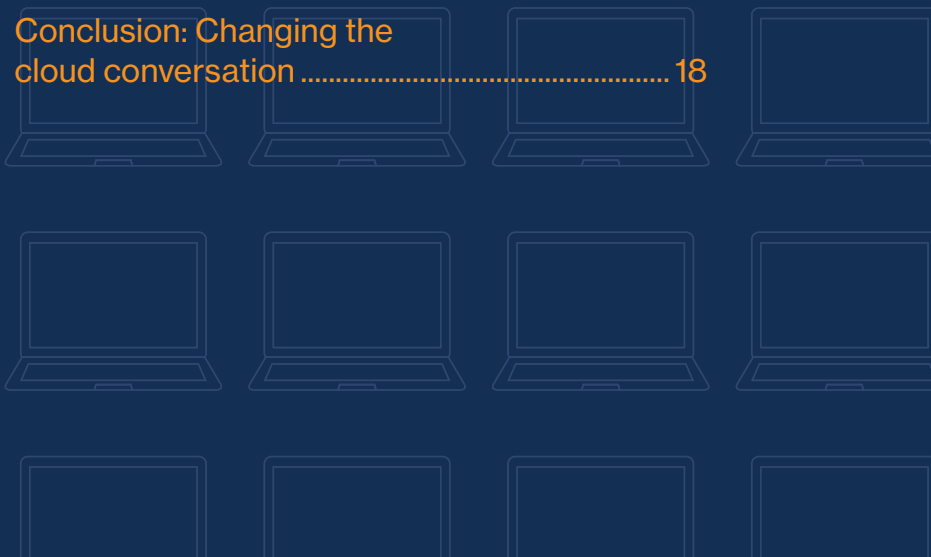
Executive summary

Every time a new generation of software is introduced, customers have to carefully weigh the benefits and costs of shifting to the new paradigm against the disadvantages of continuing to operate an increasingly obsolescent system.

However, the corporate decision to shift to cloud services – often from a classic enterprise resource planning system – brings up some new considerations. The shift to cloud services means that customers are connected to a limitless conveyor belt of best practices and new technologies.

Cloud services give companies a way to seamlessly introduce machine learning and artificial intelligence into their processes, without requiring an army of data scientists.

It is instructive to examine the decision-making process of the corporate leader faced with the choice between the existing legacy systems and the shift to cloud services. This decision is made within a particular market environment, including one in which competitors are adopting cloud services and using the latest technologies.

Because of the gains from new technologies and best practices, we can see the shift to cloud services as an increase in the rate of productivity growth. In effect, the use of cloud services reduces cost for a given level of sales, and therefore widens profit margins, with the benefit growing over time.

Faced with the advent of disruptive technologies such as cloud, companies often struggle to predict

how quickly change is coming, or from which quarter. What is usually missing in cloud migration decisions is a grasp of the opportunity cost of postponing them, especially the impact that doing so has on the enterprise as a whole. Without a strategy that captures the cost, organizations risk forgoing opportunities for growth. And they are failing to capitalize on capabilities available to start solving big problems that threaten their viability.

A better understanding of the cost of obsolescence can help companies make their cloud investments at the right time. For those that are at risk of falling behind or worse, it is possible not only to close the productivity gap with leading-edge investments but to reverse the decline as well.

Across the global economy, productivity growth has slowed or declined in the past decade. Yet across industries, there are exceptions. The oil and gas extraction, media and communications, and agriculture industries have achieved productivity gains of more than 20 percent since 2006 – more than triple the value per worker compared with lower-productivity industries such as health care, retail, and education. It's no coincidence that organizations in these high-productivity industries have also invested heavily in various types of software, spending more than five times as much per worker than organizations in industries with slow or negative productivity growth.[1]

And this gap between high-productivity and low-productivity industries keeps widening. According to a study by the Organization for Economic Cooperation and Development (OECD), "frontier" firms – the most productive companies – are up to five times more productive than peers in their industries.[2] Meanwhile, the growing advantage for the most productive organizations hinges on their continuous adoption of new technologies for increasing automation and developing new products and services.

Many organizations are accustomed to investing cautiously in new technologies, or not at all. But now, a decade after cloud computing emerged in the enterprise, their hesitation puts them at greater risk than in the past. Due to the capabilities that cloud enables, traditional strategies for boosting the performance of existing systems, making incremental updates, or bolting on limited new functionality are becoming insufficient to keep pace with competitors that are using the cloud to transform their operations and create new business models.

"I think most companies are racking up a lot of technological debt," observes a senior vice president and CIO of a health-care logistics provider. Business leaders are typically reluctant to replace systems

Key takeaways

When evaluating cloud investments, organizations can go beyond the typical business case, which encompasses the use of cloud services to reduce IT-related costs. Consider:

- The use of cloud services to accelerate business transformation via new technologies that are designed for optimal use in the cloud.
- The accelerated obsolescence of legacy systems in a highly competitive environment.

Depending on their competitive situation, enterprises in any industry that stick with legacy non-cloud systems may find their margins squeezed or growth slowed. Some firms may decide to invest in their legacy systems in order to at least partially match the capabilities of cloud-based systems. Whatever the approach, however, a view of the impact of cloud services on revenue, market share, market preservation and expansion, and profits, enables a fuller estimate of the returns, which may in turn lead companies to make their cloud investments a higher priority.

that still work, and it hasn't been easy for IT leaders to demonstrate how technology limits future capabilities. "You can work your way around a lot of things, but ultimately the cost of those workarounds is really going to suck you dry."

90%

Cloud computing will be mainstream in over 90 percent of large global companies within three years. That is, the majority of applications — close to 80 percent — that are "eligible or relevant" will be in the cloud.

Richard Pastore, Senior Director and IT Research Advisor, The Hackett Group

Organizations that do not adopt cloud-based applications and infrastructure now risk rapid obsolescence — of their information systems and their businesses. For instance, according to a February 2018 research paper, "Intelligent Finance: How CFOs Can Lead the Coming Productivity Boom," forgoing cloud investments ultimately increases costs and lowers profit margins.

Yet the methodologies that organizations typically use to determine the value of IT investments are blind to the speed at which technology capabilities are advancing and the long-term consequences of postponing cloud adoption. Rather, the underlying assumption about cloud computing, which dates from its earliest days, is that it confers an operational efficiency benefit. While many organizations have found this to be true[3], there are benefits beyond technology costs and incremental operational savings that are not accounted for by the cost-benefit evaluations used to make cloud migration decisions.

As a result, organizations may postpone cloud initiatives that do not produce immediate savings. Yet when organizations adopt cloud, they facilitate the diffusion of new technologies and best practices. They gain access to leading-edge capabilities continuously, with comparatively minimal effort — capabilities they need to support artificial intelligence, including machine learning, as well as internet of things, blockchain, and

other advanced applications that are becoming essential to remaining competitive.

By now, most organizations expect to migrate their existing systems to the cloud. Although the optimal timeframe for doing so will vary by industry, decisions to put off these investments will prove fatal to many organizations — and sooner than most executives think. Organizations need a better framework for visualizing the business impact of cloud investments that illuminates their contribution to growth.

The "Intelligent Finance" paper explored the linkages between cloud services and productivity, as well as technology spending and how the expansion of cloud-based technologies and the adoption of best practices can narrow the gap between all enterprises and industry leaders. What has been missing, however, is a method for connecting cloud-based investments with increased profits and productivity.

By incorporating factors such as the productivity gains from cloud technology, the impact of competition, the cost of staying current with legacy systems, and the rate of cloud adoption within an industry, companies can identify not only the cost of technology obsolescence but also a broader range of business benefits to make a persuasive case for accelerating cloud investments (see "Key takeaways" box, page 5). A broadly applicable model for proving

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the value of accelerating cloud investments and accurately weighing the cost of technology obsolescence has been elusive. But as this paper will show, leading enterprises are grappling with this challenge and finding a direction that holds significant promise.

The new case for cloud computing

Whereas high-productivity industries, which also invest heavily in technology, have seen double-digit productivity growth, low-productivity industries, which are largely at the beginning of their digital transformations, are losing ground. The most productive companies are also the largest, and there is evidence that their size has enabled them to take advantage of technology to accelerate their gains.

However, the diffusion of technology best practices available through the cloud potentially enables all companies, regardless of size, to catch up with the leading edge in their industries. In this way, cloud computing becomes a democratizing force. Take AI, which requires mass storage of data to feed algorithms and enough processing power to run them quickly. "AI has been made possible by the cloud," observes R "Ray" Wang, principal analyst and founder of Constellation Research, a technology research and advisory firm. "Most companies don't have the resources, the capital, or the talent to consider building an AI program on their own."

A survey by the firm of 50 C-level executives about their AI budgets and programs found a majority building applications in-house. But most of these early-adopter organizations also were using cloud-based machine learning and deep learning services to run homegrown applications, and close to half were adopting packaged software-as-a service (SaaS) applications.[4] The majority of respondents were from companies with annual revenues of less than $500 million.

The diffusion of benefits accrue to companies small and large. Iron Mountain, a $3.9 billion data and records management company, recently launched a product that provides machine learning services to customers using records they have stored with the firm. "We never would have built this on-prem in a million years," says CTO Fidelma Russo. Due to the time and expense involved, competitors with deeper AI expertise would have beaten the company to market, but using the cloud, Iron Mountain put up the service in nine months. The cloud, Russo continues, offers "a more level playing field between companies that are traditionally technology-oriented and more brick-and-mortar companies, or companies that provide services but are not technology companies."

The case for migrating existing systems in order to gain access to new capabilities isn't as easy to make. "Access to capabilities I can consume decreases my time to market, gives me more at-bats earlier in the cycle, and potentially increases my market share," Russo explains. "The problem is they are very hard to justify to a CFO who is looking for hard savings now, not future savings in productivity later on."

It's a problem because future productivity gains depend on digital capabilities. Research by the McKinsey Global Institute estimates that 60 percent of productivity-boosting opportunities during the next decade will be digital, but that currently the economies of Europe and the United States are running at less than 20 percent of their "digital potential."[5] On a fundamental level, digital means the cloud, not only because advanced technologies are built for it, but also because investments in these technologies have the broadest impact when companies migrate their legacy systems and infrastructure and use the cloud to transform how they operate.

The health-care logistics provider is "going full cloud," the result of a recent deal. "They wanted a turnkey environment to run separately from their other divisions," explains the CIO. Financially, it made more sense for the company to replace its legacy systems than to make copies of more than 400 applications and spend $10 million on hardware to run them.

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>
> Fidelma Russo, CTO, Iron Mountain

Initially, the CIO is focused on optimizing IT in the cloud to reduce costs and streamline the number of business applications the company uses. When the migration is finished in 18 months, the company won't own any hardware, and all of its software will run in the cloud.

"The ability to do analytics and get questions answered from a digital, internally facing perspective is going to be a lot greater," says the CIO. With the cloud infrastructure in place, however, "we'll be much more positioned with our marketing and our sales team to co-develop digital products." For example, by putting IoT sensors and software into its devices to collect data about how they are used, the company could discover ways to improve the devices, or it could sell services based on the data to help doctors manage patients' treatment more effectively.

Without the recent major deal, migrating major business systems to the cloud — especially consolidating three enterprise resource planning systems into one as the company is doing — "would have been a tough sell," says the CIO. "As much as we were struggling with the quality of our data, it's difficult to build a business case on 'it's tough to get data.' It usually takes a triggering event."

More talk than action
There's broad consensus that companies should, and eventually will, move their operations to the cloud.

There are only a handful of reasons why companies would leave a legacy system off the table for migrating to the cloud. Regulations — especially those concerning storage of sensitive and personal data — may prohibit it. In cases where an application is not widely used in the company, or it is not significantly implicated in plans for future growth, business leaders may decide the investment isn't worthwhile.

Technology leaders may also balk at the disruption that cloud engenders within IT, and worry about losing control of their IT environments, says Stefan Rehm, CEO of Intelipost, a São Paolo company that provides SaaS-based transportation and logistics management applications for retailers. "Some companies are more hesitant than others" to move to the cloud, Rehm says. "The non-mission critical systems will go first. But overall, of hundreds of clients we talk to, only one or two are asking us about an on-premises environment."

Research by The Hackett Group, a strategy consultancy, concludes that cloud computing will be mainstream in over 90 percent of large global companies within three years. That is, the majority of applications — close to 80 percent — that are "eligible or relevant" will be in the cloud, says Richard Pastore, senior director and IT research advisor with the firm. These investments include manufacturing,

monitoring, and control systems that may not be within the traditional purview of IT. Even laggards have deployed SaaS applications, though they are doing so more slowly than their peers.

These investments are being driven by aging infrastructure and applications, as well as a growing acceptance among IT and business leaders — and in some jurisdictions, regulators — that cloud services offer better security than on-premises systems. However, it's debatable whether companies have fully embraced the cloud as a foundation for ensuring their future competitiveness. The Hackett Group has found that cloud adoption varies widely by business function: within three years, 92 percent of applications used to run IT will be in the cloud, but that is true for only half (52 percent) of global business services applications and 44 percent of finance applications.[6]

According to data compiled by Eurostat, the European Union Statistical Agency, among 28 EU countries only 21 percent of enterprises used cloud computing services in 2016, while far fewer (11 percent) had "a high level of dependence" on them — meaning they used the cloud for finance, customer relationship management, or to run their enterprise applications, rather than for email, office productivity, or storage.[7] A more recent survey of 550 IT decision makers by IDG, a technology media company, meanwhile, found that on average, 52 percent of the IT environment in companies is not yet in the cloud. In addition, respondents reported that their immediate priorities for cloud migration are disaster recovery, development and testing, and "system management/DevOps."[8] (DevOps is an approach to software development that incorporates automation to speed delivery of applications and updates.)

Taken together, these findings suggest that for many companies, current decisions to migrate existing applications and infrastructure to the cloud are primarily to improve IT operations rather than to enable new business opportunities. IDC recently

60percent

of productivity-boosting opportunities during the next decade will be **digital,**

but currently the economies of Europe and the United States are running at **less than 20** percent of their **"digital potential."**

Source: McKinsey Global Institute

predicted that within a couple of years, "more than 40 percent" of clouds serving the manufacturing, oil and gas, and utilities industries will include data from operational assets, and more generally "at least a third" of industry clouds will support standard application programming interfaces.[9] Although this counts as progress, the forecast suggests that cloud implementations in general do not yet encompass the systems that are critical to future business success. Gartner expects enterprise spending on cloud computing to nearly double over a five-year period ending in 2021, an indication that organizations are still tapping much of its potential.[10]

If that is the case, then most companies will not be well-positioned to take advantage of the cloud when they need it. "We are making the same mistakes over and over again," says Jerry Luftman, managing director of the Global Institute for IT Management, which offers executive education and certification programs for technology leaders. Luftman spent 23 years at IBM, including a stint as CIO. The question

With productivity and growth in the equation, cloud adoption that enables business transformation and protects the organization from the risk of obsolescence delivers greater benefits than the typical IT-focused business case can describe.

about whether or not to move to the cloud isn't that different from decisions about investing in foundational technologies like personal computers or the internet in earlier decades. "More of the focus should be on the revenue-enhancement capability," he counsels.

Three examples illustrate how companies are putting benefits for customers at the forefront of their cloud investment strategies:

Faster transactions. At Arab Jordan Investment Bank, CIO Ayman Qadoumi doesn't have a cloud migration strategy per se. Rather, he says, the business strategy is focused on the digital transformation and the innovation needed to meet the expectations of increasingly tech-savvy customers. "They want different financial products and services than what we are currently using," he explains. "One of the tools to achieve digital transformation and innovate some of the services is migration to the cloud."

The bank recently completed a proof of concept using blockchain, a cloud-based method for securely validating and recording transactions, to reinvent cross-border money transfers. If someone wants to send money to a family member abroad, the usual process can take three days and involves using intermediaries, even though the funds move within the bank. Using blockchain in its test, AJIB was able to transfer money from Jordan to a subsidiary in Cyprus instantly. "This is a huge enhancement to the customer experience," notes Qadoumi, and it also lowers costs.

AJIB needs regulators' approval before rolling out the blockchain service to the public. Internally, meanwhile, business leaders now have a greater appetite for cloud investments than in the past. "For the blockchain, our chairman was one of the biggest supporters of the idea," Qadoumi says. "All the decision-makers are more in favor of going to the cloud because they now understand the benefits."

Streamlined logistics. Intelipost, the SaaS logistics software company, views blockchain services as the key to improving customers' supply chain efficiency. By aggregating data about delivery performance for numerous shippers, Intelipost helps its customers — which include multinational firms — choose the best firm for any given shipment. It's an improvement over typical arrangements retailers might make with a limited number of transportation providers.

But the industry has other inefficiencies. Transporters still use decades-old technologies such as electronic data interchange or point-to-point file transfers to exchange data. Blockchain would enable them not only to leapfrog current internet-based methods for moving information, but would also improve supply chain efficiency.

By using blockchain, all parties involved with a shipment — including the shippers, transporters, insurers, and third-party importers and exporters — would have access to the same authenticated information about every shipment. "If you have five shippers and five transporters, in the past you needed to do 25 integrations because every shipper needed to be integrated with every transporter,"

Rehm says. "With blockchain there will only be 10 integrations, because every participant will integrate itself with the blockchain, and that's it."

For customers that are already using the cloud, integrating with the blockchain will likely be easier than if they are working from on-premises systems, Rehm suggests.

Deeper customer engagement. In 2018 Mutua Madrid, which runs the Mutua Madrid Open, a Masters tennis tournament, deployed "Matchbot," a chatbot that uses AI and natural language processing in the cloud to answer fans' questions about the players, schedules, and the venue and its amenities. A highlight: fans were able to use Matchbot to purchase tickets.

The Mutua Madrid Open launched in 2002 and features top international players, including Spain's Rafael Nadal and the Czech Republic's Petra Kvitová. Although the star lineup, especially Nadal, draws many fans, Mutua Madrid has made technology innovation that increases fan engagement a central tenet of its business strategy, says Javier García Río, the head of marketing.

"The cloud gives us global accessibility in the right moment," he says. "To offer the best customer experience and be the most disruptive tournament, we need the latest technology, and the cloud offers that."

According to García, Matchbot is the first chatbot to be deployed by a major international tennis tournament, and it has simplified how fans interact with the company. The 10-day tournament offers dozens of ticketing options, including multi-day packages. When he pitched the idea to other executives, he argued, "If we have this chatbot, the user experience will improve 100 percent. The interaction with one chatbot will be more friendly and faster" than paging through the Mutua Madrid Open website.

For 2019, García says, the plan is to integrate the chatbot with Mutua Madrid's legacy customer data. That will enable the chatbot to identify each customer and know their ticket preferences based on past purchases. The company has begun to explore putting customer data in the cloud, which "could be more efficient," García says. But it will also take time. Mutua Madrid must involve the external company that manages its ticket sales, whose systems are not yet in the cloud. And it needs to ensure any solution complies with the EU General Data Protection Regulation.

Rethinking technology obsolescence

Both AJIB and Mutua Madrid have deployed brand-new core capabilities in the cloud as steps along their digital transformation paths. Telstra, the $18.4 billion telecommunications carrier based in Melbourne, Australia, is nearing the end of that road.[11] The company is migrating its "lead-to-cash" applications — the core applications used for sales, service, and billing — to a SaaS platform. Customers are demanding more pay-per-use products and services, says Sundi Balu, CIO for enterprise and international. The legacy billing application "required a mammoth effort to update and maintain," whereas the SaaS software provides the needed capabilities "out of the box."

Migrating applications to a SaaS platform is the final step in a multi-year cloud program that began with moving applications from dedicated infrastructure in data centers to an internal cloud or hybrid cloud environment, decommissioning obsolete hardware in the process. The effort underpins a key objective of Telstra's business strategy, which includes simplifying its products and creating "all digital" customer experiences.

Balu observes that the life cycle of both infrastructure and software has become shorter. Fifteen years ago, when he was working for a bank, IT products and services, as well as customer expectations for them, shifted slowly. A technology

"I see [cloud] advantages that go much farther than cost."

Pedro Uria-Recio, Head of the Axiata Analytics Center, Axiata Group

refresh every five to seven years was sufficient. Today, he says, expectations for technology change every six months; the longer one waits to add new capabilities, the more it costs to catch up. If a company doesn't time its upgrades right, it will be "significantly hampered" competitively.

In other words, technology is becoming obsolete more quickly, but the way companies typically think about technology obsolescence hasn't caught up. In part, business executives' ideas about obsolescence are grounded in traditional conceptions about the opportunities and risks of new technology. Financial decision-makers, in addition, find it challenging to justify decommissioning business systems that on paper have not fully realized their value, and in practice are sufficient for the purpose they were originally deployed.[12]

In the past, companies that eschewed early adoption of new technologies did so because there were big risks to being first. Early adopters had to deal with all the bugs, while best practices emerged as they worked through their implementations. Companies could benefit by waiting and could catch up when the

technology became proven. Sometimes that would take years.

What's more, major technology shifts are expensive and highly disruptive. Business process changes — often extensive — are required to make big technology investments successful. Although the 1990s wave of IT-enabled transformation had a positive impact on the economy overall, business leaders in the throes of change, or spooked by the story of a spectacular failure, formed a perception not easily shaken that new technology did not always deliver benefits that exceeded the pain of change.

Meanwhile, business executives often felt no urgency to invest. Vendors usually did not issue major new software releases more often than every couple of years, and the labor-intensive process for implementing them meant the functionality still would not be delivered quickly. In addition, companies were able to pay for maintenance on existing systems from vendors or third parties to keep old versions of software running.

For companies in slow-moving industries or that preferred to follow rather than lead trends, that was often enough to remain competitive. They could continue to function by bolting on new capabilities (like an e-commerce server) one at a time, or by making incremental updates to existing systems, and reasonably expect to catch up with the next version of an enterprise application. Even if this approach ultimately raised IT costs, maintaining legacy systems was a reasonable decision.

The cloud is different

The cloud changes the calculation. Technology upgrades are now rapid and iterative, with new capabilities available every few weeks or months; companies can turn on the new functionality whenever they want or need it. Availability, ease of implementation, and the lower costs of incremental advances lower the stakes for adopting new technology, enabling companies to innovate quickly,

and with less risk. Respondents to a 2018 survey of 502 US businesses by CompTIA, a membership organization for IT professionals and vendors, reported overwhelmingly that the cloud enhanced their automation initiatives, citing access to new tools, a lower cost of exploring new technology, and the ability to consolidate data sets among the ways cloud enables emerging technology initiatives.[13]

Once adopted, cloud-based capabilities enable rapid, even exponential — and unpredictable — change. In the consumer realm, every smartphone has a voice-enabled assistant. Once users start using it to make phone calls, dictate texts, or set alarms, tapping the screen and thumbing the keyboard becomes time-consuming and inconvenient (it's hard to do while walking, for instance).

Meanwhile, consumers are steadily adopting home assistants that offer similar capabilities. These are still a novelty in many homes that have them — used to play music or make hands-free phone calls. But the investment in a home assistant has greater potential than it might seem initially. If a homeowner decides to install smart thermostats and lights or other home technologies, which require the cloud to operate, the additional capabilities are already included.

It took more than 80 years from the invention of the telephone for landline usage to surpass three-fourths of US households, but only six years from the introduction of the iPhone for smartphone usage to reach a similar level. Smartphones, in turn, have triggered the rapid abandonment — and impending obsolescence — of landlines in the United States, as consumers take advantage of the productivity enhancements smartphones offer.[14] It's fair to say that consumers have been willing to pay several hundred dollars for a smartphone because from the beginning it was obviously more than a replacement for the telephone (or a far-cheaper flip phone).

For the enterprise, there are entire new classes of business applications, like AJIB's blockchain service,

Within a couple of years,

"more than 40 percent" of clouds serving the manufacturing, oil and gas, and utilities industries will include **data from operational assets.**

"At least a third" of industry clouds will support standard application programming **interfaces.**

Source: IDC

Mutua Madrid's chatbot, smart devices like those anticipated by the health-care logistics company, and machine learning services like that offered by Iron Mountain that can't be delivered cost-effectively using legacy on-premises systems. Businesses that have cloud-enabled infrastructure and applications, however, can quickly engage them for new, productive uses when the need arises.

Although industries may still adopt advanced technologies at different rates, the rapidity with which new technologies can be deployed in the cloud and the resulting chasm between the capabilities of cloud and legacy systems means that the old models for thinking about obsolescence — as a function of usability, supportability, and the cost of replacement — no longer apply. And yet the cost of obsolescence is difficult to see due to the typical ways that IT departments justify cloud investments.

For new applications, the cloud is usually the default choice. "Remember that application developers

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reached a point where they said 'we're going to go mobile first,'" recalls The Hacket Group's Pastore. "I think cloud is getting to that point. Even to the point where it's public cloud first. And IT has driven that."

The need to move

But when deciding whether to migrate any existing system to the cloud, business leaders tend to treat it as an IT decision primarily, without giving as much consideration to the business benefits. Migration decisions are likely to be triggered by security vulnerabilities that can't be effectively patched, hardware that has depreciated or reached the end of its useful life, and whether a vendor is ready with a cloud version of an application or phasing out its on-premises support. Though decision-makers may see a clear return on investment, they might still not be able to justify the change just to make what looks like a small performance improvement.

Even an IT-centered cost-benefit calculation can be challenging to make if an organization doesn't know the baseline costs of their legacy systems. They have to account for these first, notes Pastore. Cloud options don't always look cheaper by comparison, given that subscription fees shift some of the spending for systems from the capital to the operating budget. IT leaders now assume that security, system availability, and disaster recovery will improve beyond what they can provide internally, though they can't always quantify these benefits.

At Waste Industries, a $700 million waste collection and recycling company in North Carolina, Hubert Barkley is hoping to migrate an on-premises financial management application to the cloud next year. Annual support costs will be higher, says Barkley, vice president of information and technology. "But the benefit is I don't have to have two engineers tuning it, and I don't have to upgrade my equipment every two or three years." He also anticipates future savings from getting software upgrades with the cloud subscription, rather than having to pay a contractor to install them.

Business leaders' perceptions of the need to innovate, and their willingness to upend business processes, can trump even a positive IT business case, however. Barkley has invested in cloud applications that make operations more efficient: he has deployed sensors to track and collect data about the performance of the garbage truck fleet, and he is implementing a payment application that would enable customers to pay by text.

But when it comes to core systems, company leaders can be reluctant to abandon on-premises versions they are comfortable with, even if a newer cloud system would cost less to operate. "The mantra here has been "If it's working, why mess with it?'" Barkley says. Given that the industry, in general, has been slow to adopt new technologies, he concedes the point. Earlier in his career he worked in the telecommunications industry. There, "you would be killed right now if you weren't migrating to cloud."

"You need to have an organization that wants to move, and this is not something an IT leader can decide," agrees Pedro Uria-Recio, who heads the Axiata Analytics Center, a data analytics team within Malaysia-based Axiata Group. The company provides telecommunications services in southern Asia and recently launched a cloud-native digital advertising business.

Axiata is in the process of migrating its corporate data to the cloud (customer data, which is regulated, will move last). The cloud will make the data more secure and cost the company less over time, "but it's not going to be overnight because the cost of on-premises infrastructure is sticky," Uria-Recio says. "It's depreciating over a number of years, and as long as the data center is working, you will wait until it gets old or too small, and you have to go somewhere else."

The gains from transforming the business are harder to quantify. "Putting information in the cloud makes it much simpler for a conglomerate like us to have marketing teams in different countries collaborate," he offers. "I see advantages that go much farther than

cost." One of the first projects his team has tackled is to create models for predicting customer demand using data that has been consolidated in the cloud from all the operating units. The operating units will be able to optimize their investments in equipment such as towers in areas where they anticipate the greatest growth. "The models can be deployed in all the countries in an easy and standardized way just because the information is centralized in the cloud," Uria-Recio explains. "We can understand much better where money is necessary to improve the network and where it is not and deploy capex in a much more efficient way."

Competitiveness plays a role in cloud migration decisions.[15] In a fast-moving industry, companies face more pressure to accelerate their cloud investments in order to stay ahead, or at least keep up. Business leaders take cues from customers about the capabilities they need, and thus the technologies they should deploy. At Iron Mountain, says Stuart Brown, executive vice president and CFO, a cloud project that addresses a customer need would have a higher priority than a back-office application. But even when considering the customer, there are guesses.

Previously, Brown worked in the restaurant industry, where a startup would put its IT in the cloud, but business leaders making decisions for an established brand might be weighing a cloud migration against a plan for new carpeting. "There's a risk of technology obsolescence in what we do every day, but a company only has so much capital to invest," he adds.

Waste Industries has been growing through acquisition, and Barkley anticipates advantageous technology investment opportunities in the purchased companies. For example, recent acquisitions included trucks that are equipped with cloud-connected computers; Barkley is studying whether to deploy this technology — significantly less expensive than it was a few years ago — fleet wide. "My hope is that as we buy companies and they have things that are potentially innovative, those are things we can use in our environment and get rid of our legacy applications."

Enterprise **spending** on cloud computing will **grow** more than

160%

by 2021.

Source: Gartner
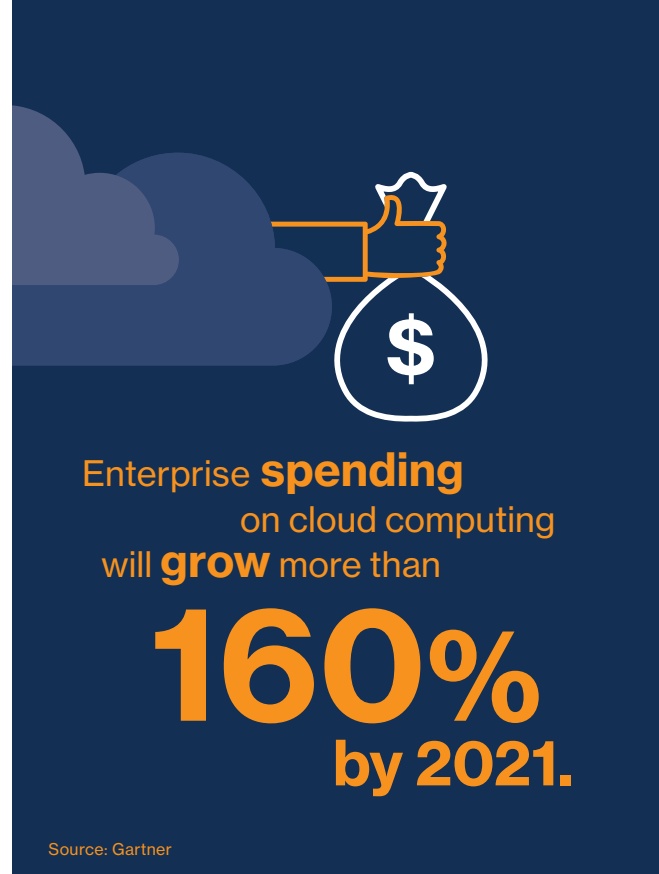
But companies often struggle to predict how quickly they might be disrupted, or from which quarter. Because the cloud accelerates the diffusion of best practices for employing new technologies, a better understanding of the cost of obsolescence can help companies make their cloud investments at the right time. For those that are at risk of falling behind or worse, it is possible not only to close the productivity gap with leading-edge firms but reverse their decline.

Exploring the cost of technology obsolescence

What is usually missing in cloud migration decisions is a grasp of the opportunity cost of postponing them, especially the impact that doing so has on the enterprise as a whole. Without a method that captures the cost, firms risk forgoing opportunities for growth — which accrue to both the firm and the broader economy. And they are failing to capitalize on capabilities available to start solving big problems that threaten their viability.

Consider health care. As observed in the "Intelligent Finance" paper, productivity in the industry has

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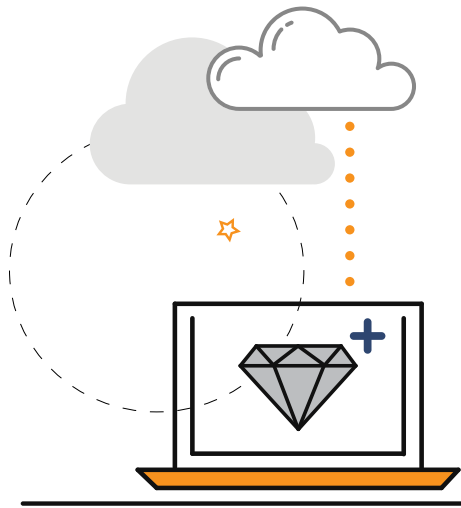
The question about whether or not to move to the cloud isn't that different from decisions about investing in foundational technologies like PCs or the internet in earlier decades. "More of the focus should be on the revenue-enhancement capability."

Jerry Luftman, Managing Director, Global Institute for IT Management

slowed. In the United States, according to data from the U.S. Census Bureau and the Bureau of Labor Statistics, spending on health care, and the health-care workforce, has grown faster than the population as a whole, even accounting for the impact of an aging population.

Cloud services enable a way to reverse these trends. The health-care industry is turning toward an approach to patient care based on "population health" — that is, identifying ways to improve clinical outcomes for defined groups, such as patients with diabetes, while controlling costs. For example, if patients are monitored to ensure they follow their treatment plan, they are more likely to remain healthy and stay out of the hospital, where the cost of treating them is higher.

Without predictive analytics and, increasingly, the application of machine learning in the cloud, health-care providers and insurers would not have the tools to analyze voluminous data on patient health and spending to identify the most cost-effective interventions. Cloud technology offers the potential to take out hundreds of millions of dollars in costs, by some estimates, while at the same time improving the overall health of the population. Yet as of 2017, only 29 percent of health-care firms were using cloud technology in finance.

Based on the analysis of software spending differences between low- (such as health care) and high- (such as oil and gas extraction) productivity industries, the paper concluded that, conservatively, cloud services can boost annual productivity growth in low-productivity industries by 0.5 percentage points. In terms of dollars, the widespread adoption of cloud, along with the digital technologies and business practices they enable, could add $2 trillion to the US economy alone.

Look beyond the cost savings

By keeping the business productivity and growth potential from cloud services in mind, organizations can see beyond the costs and efficiency savings of these investments. As described in the "Intelligent Finance" paper, accelerating cloud investments — whether in infrastructure, platforms, or software — can deliver productivity improvements to the enterprise as a whole.

The report makes several points about impacts of cloud adoption that can be difficult to evaluate. First, in exchange for the initial disruption and cost of adopting cloud services, the shift "clearly brings all the short- and medium-term benefits that we've come to expect: a reduction of IT capital expenditures, easy scalability, a shift of IT personnel

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Cloud services enable organizations to close the productivity gap with the most productive firms in their industries.

from routine maintenance to projects that support critical business goals, and improvement in security."

In addition, the report argues that cloud services have a second, broader effect related to technology diffusion. "One can think of cloud services as accelerating the pace of diffusion of 'best practice,' broadly defined," the report says. That is, "not just today's standardized processes, but also the best current thinking about how to employ new technologies such as artificial intelligence and machine learning. In the era of the cloud, best practice becomes a well-organized toolbox that is continually upgraded with the latest tools."

Cloud services enable organizations to close the productivity gap with the most productive firms in their industries. As a result, enterprises that shift to cloud services can get sustained productivity gains rather than a one-time bump.

Organizations must understand the cost to productivity of staying with legacy systems, as well as the cost of staying current with new technologies and best practices while retaining those legacy systems.

The important challenge they face is to take competition into account because, as most firms have experienced, customers and suppliers are becoming more demanding. As the companies featured in this paper are learning, a cloud foundation is essential to new offerings — both products and reimagined business processes — that would not otherwise be cost-effective, but without which they might find it increasingly difficult to stay competitive in their respective industries. As described, for instance, the cloud levels the playing field for Iron Mountain to build a machine learning service, enables fresh insights into capital spending needs for Axiata Group, and supports leading-edge capabilities that customers are demanding from Arab Jordan Investment Bank.

A company might approach the problem of evaluating the growth opportunities enabled by cloud adoption and the cost of waiting too long as follows. Consider a manufacturing firm that spends in the low range on IT — about 1 percent-to-2 percent of revenues. The firm may be anticipating low revenue growth, and it may be under tremendous pressure to both cut costs and raise productivity.

Given that the company also wants to update the equipment on the shop floor, the initial cost of cloud investment and the expected reduction in IT spending may make shifting to the cloud appear as a low-priority project. However, manufacturing is evolving quickly, and the cloud will allow applications of artificial intelligence and machine learning to aid in production, sourcing, and distribution. As the "Intelligent Finance" paper noted, the US manufacturing industry is increasing its investments in these emerging technologies. Taking into account the gains to productivity and the cost of technological obsolescence in a competitive environment, the return on cloud investments might be achieved more quickly than is apparent when viewing them solely as an IT project.

In other words, it's possible to see that with productivity and growth in the equation, cloud

adoption that enables business transformation and protects the organization from the risk of obsolescence delivers greater benefits than the typical IT-focused business case can describe. Most IT leaders know these benefits exist, but they find it challenging to quantify the impact of innovative initiatives that may not have been imagined yet because the tools to deliver them aren't yet available.

Conclusion: Changing the cloud conversation

Having a way to talk about issues of cloud investment and competitiveness (as suggested in the "Key takeaways" box, page 5) would change the conversation CIOs have with their C-suite peers about whether, and how quickly, to adopt cloud services from a discussion about IT costs to one about the future of the business.

"What I've found in using some of the frameworks … and even with some of the benchmarking, is that it's easy to say, "I don't think that will happen here," or "I don't see how they get that,"" recounts the health-care logistics

provider's CIO. "But to have the marketing or the sales guy go, 'Yeah, and here's how so-and-so is going to eat our lunch, and here's what you need to do,'" and to be right there with you — that is pretty powerful."

The decision whether to invest or not in the cloud is ultimately a decision about creating revenue and preserving or expanding markets, market share, and profits. Without cloud technology, organizations won't be able to do what their rivals are doing. They'll be unable to offer the products and services that customers want because their legacy systems can't deliver them in a cost-effective way, or at all.

When organizations consider the cost of technology obsolescence fully, the impact of cloud services on growth and the urgency of investment for their continued viability will become clear. There is more work to be done in order to come up with a broadly useful framework that will make clear the productivity benefits of investing in the cloud and the cost of not doing so. But the path toward such a model is becoming clearer.

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