The ascent of cloud computing has enabled organizations small and large the ability to scale computing resources to meet their workloads, eliminating the need for building and maintaining data centers, slow CapEx planning processes, and likewise eliminating costs of the expense powering servers with unutilized capacity due to variable workloads.

Potential benefits of cloud computing have not been realized uniformly across all industries, however. A number of sectors have unique data protection or retention regulations, or contextual factors—such as poor internet connectivity in places of work—that limit the practicality of general-purpose, fully public cloud deployments.

As cloud solutions continue to mature, major public cloud providers are investing in solutions to meet specialized industry needs. Likewise, specialized cloud service providers are entering the cloud wars to deliver highly polished and targeted features and support, acting as a “cloud concierge” to migrate legacy/on-premises systems into the cloud, as well as providing industry-specific applications. Together, these initiatives are known as the “industry cloud.”

Industry cloud represents efforts from traditional public cloud providers, such as Amazon Web Services (AWS), Google Cloud Platform, or Microsoft Azure, to provide tailored solutions to meet the needs of organizations with business operations in industries that are subject to data protection or retention regulations, operations with mission-critical applications, and industries that experience regulatory restrictions on software use that disallow the rapid changes endemic to software development. Specialized industry-focused cloud service providers, including athenaHealth, NTT DATA, SAP, Veeva Systems, Medidata, NCR, and Shopify, likewise provide tailored solutions for specific industries.

These services extend beyond typical Software-as-a-Service (SaaS) offerings typical to customer relationship management (CRM) and enterprise resource planning (ERP) services, and extend into platform-as-a-service (PaaS) and infrastructure-as-a-service (IaaS) offerings.

Likewise, industry cloud is not limited to being an exclusively public cloud deployment, as regulations or preferences for data warehousing may limit the amount of data stored in public clouds, as can worksite factors that limit connectivity where data is generated or used. Hybrid and private cloud deployments can be executed with the assistance of system integration firms with expertise in cloud onboarding and digital transformation.

Multiple industries face challenges specific to their business operations that add layers of complexity to adopting cloud computing.

Healthcare cloud services are an increasingly attractive option for hospitals and primary healthcare providers, as patient-facing operations face regulations such as HIPAA, which complicate access and storage of patient charts and records. (Conversely, pharmaceutical research, and other non-patient-facing practices enjoyed a several-year head start on cloud adoption, as data protection regulations are less of a factor for those businesses.) The potential for a data-driven healthcare system may aid in more efficiently serving patients.

Financial services require special accommodations to adopt cloud computing services, as PCI and SOX compliance complicates the adoption of decentralized technologies. Likewise, the insurance industry can benefit by taking data generated from Internet of Things (IoT) devices to determine potential risks that drivers pose on the road.

Industries that operate apart from traditional offices, with mobile-first employees that migrate from worksite to worksite—such as oil rigs—face greater difficulties using standard cloud solutions, due in part to the limited connectivity that comes with these settings. Likewise, agricultural use of cloud computing is hampered by connectivity issues of IoT devices deployed in fields.

Industry cloud should be considered a superset of general-purpose cloud computing, as industry cloud solutions from the “big three” public cloud vendors act as a bridge to enable the use of their fully matured cloud solutions, for business settings in which additional options or features are needed.

Among mainstream vendors, investment is increasing in industry cloud, as growth in the market for general-purpose cloud computing has softened—sectors that can easily migrate to cloud computing already have, or are midway through their migration. This has prompted investment by public cloud vendors to address industry-specific needs in order to maintain growth.

Likewise, there are more than 100 smaller vendors that specialize in industry cloud—either cross-industry or specializing in the needs of a particular sector. According to IDC, industry cloud expenditures within healthcare totaled $12.1 billion in 2018, with public sector at $8.4 billion, and finance at $7.4 billion, with year-over-year growth firmly in double digits.

With more specialized applications and tailored services, industry cloud, which targets vertical industries, has won over tech professionals. In a recent TechRepublic Premium survey, 64% of respondents said they either already use industry cloud services or plan to adopt it in the next 12 months. Of respondents, only 18% maintain no plans to consider or adopt industry cloud services.

Despite the bells and whistles that industry cloud service vendors promote, many additional factors go into selecting an industry cloud service provider. Not surprising, most survey respondents based their decisions on operational cost or security/data protection. Speed and agility was another popular consideration for more than half (54%) of respondents; while 44% said implementation cost was an important selection factor. Other factors that respondents ranked as important when choosing an industry cloud service included regulatory/industry compliance, vendor industry experience, and whether a vendor provides a turnkey system for the specific industry.

Annual budgets for industry cloud services varied significantly, topping out more than $1 million and some reporting in at less than $10,000.

With 61% of survey respondents citing easy management/administration, and 54% citing secure data protection as positive outcomes, it’s no surprise that so many organizations are embracing this type of cloud service. Other industry cloud service benefits recognized by respondents include simpler cloud migration/ adoption, more agile business processes, lower cost, and industry-specific turnkey core systems, not to mention simplified regulatory and industry compliance.

However, not all respondents were fond of their industry cloud services. Some (41%) had difficulty integrating industry cloud services with existing business processes, and 37% faced migration and adoption challenges. Further, 31% of respondents cited cost as a negative factor, and 20% cited complex management and administration. A smaller percentage (19%) experienced complex management and administration, outages, poor service, and services not working as expected. Eleven percent stated that their industry cloud services were more difficult to use than expected.

The infographic to the right contains selected details from the research. To read more findings, plus analysis, download the Industry cloud report: Businesses adopt industry-specific cloud solutions (TechRepublic Premium).

SaaS applications often address broad business functions such as accounting and finance, analytics and business intelligence, collaboration, customer relationship management (CRM), e-commerce, enterprise resource planning (ERP), human resources (HR) and security. Most companies require these functions, and the leading SaaS providers in each area -- most notably Salesforce in CRM -- have prospered as a result.

However, one size of software does not necessarily fit all potential customers which is why horizontal SaaS vendors often open up their applications to third-party customisation via APIs. However, if you’re a healthcare provider, for example, you’re unlikely to relish the effort and expense of customising a series of cloud services to fit your particular line of business. And if you’re seeking mission-critical vertical-market functionality, you’re going to require a specialist software vendor with deep expertise in your field.

These are some of the reasons why an increasing number of SaaS applications address the key business issues for particular vertical markets -- a sector known as the ‘industry cloud’. This opportunity hasn’t gone unnoticed by software giants such as Salesforce, which now offers customised implementations of its CRM solution for a range of verticals: banking, communications, consumer goods, government, healthcare, insurance, life sciences, manufacturing, media, nonprofit, retail, travel & hospitality and wealth management.

But what’s happening at the other end of the scale, in the world of startups?

Emergence Capital Partners (ECP) is a Silicon Valley venture capital firm that invests exclusively in early-stage enterprise cloud companies, and the industry cloud has been a core ECP investment area for almost a decade. “At the highest level, we believe that focused cloud applications can solve the challenges of an industry better than horizontal software designed to solve a function,” says ECP’s Joe Floyd.

ECP’s industry cloud ‘thesis’ goes like this: look for a team with cloud and industry expertise that’s focused on a deep industry pain point; build that expertise into products that earn the trust of customers, who then trust the provider with their proprietary data; more data allows new problems to be identified, and resulting insights are fed into product improvement and expansion. “Happy customers talk,” Floyd notes, “and customer referrals drive an unfair advantage in terms of sales and marketing efficiency.” This creates a ‘virtuous cycle’, with continual product enhancements reinforcing customer trust, boosting revenue and market share, allowing more investment in R&D, and so on.

Here’s how that played out for the ‘poster child’ of the industry cloud.

Veeva Systems, founded in 2007 by Peter Gassner and Matt Wallach, delivers content and data management solutions to the life sciences industry, with customers ranging from leading pharmaceutical companies to biotech startups. Launched with $4 million of funding from ECP, Veeva progressed to an IPO in October 2013 with an opening share price of $20 and a market capitalisation of $2.9 billion. Since then, Veeva’s share price has climbed to $169 and its market cap to $25bn.

Back in 2015, Veeva’s CEO Peter Gassner told TechRepublic that “We’re targeting to be a one billion dollar revenue run-rate company in the calendar year 2020. We have the products we need to achieve that, but we will also make new products to feed the innovation cycle that will continue on past 2020.”

The company is currently on track, with revenue for fiscal 2019 totalling $862.2 million -- up from $690.6m in fiscal 2018, an increase of 25% year-over-year. Veeva’s guidance for fiscal 2020 (ending 31 January 2020) is for total revenues between $1,025 and $1,030 million.

Veeva’s track record shows how successful a well-targeted, well-run industry cloud company can be -- and the potential rewards for a prescient venture capital firm. ECP’s portfolio also includes: MedeAnalytics, Augmedix, Doximity and Welltok in healthcare; Project44, Drivewyze and Digital Air Strike in transportation; Top Hat and Civitas in education; along with DroneDeploy (drones), Eversight (pricing and promotions for brands), Restorando (hospitality) and IrisVR (virtual reality for architecture, engineering and construction).

Another venture capital firm with deep interest in industry cloud is New York-based Bowery Capital. Since its founding in 2013, the company has sought to capitalise on the shift to ‘internet native’ software by identifying and investing in businesses leading this transformation. Bowery Capital currently has a ten-strong vertical software portfolio: Alchemy (chemicals industry), Block Six Analytics (sports sponsorship), CredSimple (medical credentialing), Fero Labs (ML for the industrial sector), GoExpedi (MRO procurement in industrial sectors), Oncue (booking platform for moving logistics companies), ShiftOne (learning management for restaurant/hospitality/retail firms), SwiftShift (workforce management for the home healthcare industry), Transfix (long-haul freight brokerage automation) and Voxy (e-learning management).

Every year, Bowery Capital profiles and highlights over 500 vertical-focused companies for its Opportunities in Vertical Softwarereport, now on its third edition. Companies are classified into industry sectors that are scored on market size, market growth, competition and opportunities, using a three-point scale (positive/high, intermediate, negative/low). Each sector also gets an overall score on the same scale.

To make the above graph, we assigned a ‘positive/high’ overall rating three points, ‘intermediate’ two points and ‘negative/low’ one point, across the three editions of Bowery Capital’s report. This suggests that manufacturing, aerospace/drones, and transport & logistics consistently offer the biggest opportunities for vertical software companies, followed by the insurance and legal sectors.

A notable entrant in the third edition of Opportunities in Vertical Software is the cannabis sector. According to the venture capital firm, 33 US states and the District of Columbia currently have legislation broadly legalising cannabis use in some form, and VCs have spotted an opportunity. “Venture capital investments in the cannabis vertical totaled $409m in 2017, $1.024b in 2018, and $1.265b in the first half of 2019. Software investments have represented only a small fraction of activity: since the beginning of 2017, just over $153mm of venture capital has been invested specifically in cannabis SaaS companies across 27 deals. 2017 to 2018 saw a 35% increase in capital invested in cannabis-focused SaaS companies, and 2019 is on track for a 45% YoY jump.” The market for legal cannabis in the US was valued at $11.9 billion in 2018, and by 2025 it’s expected to be $26.3b, Bowery Capital said.

This article seeks to give a flavour of the range of vertical SaaS companies that have grown up in the last five years or so. There are many, many more: a few will achieve Veeva levels of success; some will grow steadily, perhaps eventually going public and/or being acquired by a big software player; others will fall by the wayside, for whatever reasons.

As ever, if you’re seeking a software partner that fits your firm’s vertical market niche, due diligence is the key.

The trend of moving data to the cloud has exploded over the past few years, especially with cloud giants like AWS, Microsoft, and Google taking the enterprise by storm. The global cloud infrastructure services market grew 42% year-over-year in the first quarter of 2019, according to a recent Canalys report.

“When we use the term cloud and when our clients use the term cloud, they typically are thinking in at least three different dimensions or directions,” said Andrew Bartels, vice president and principal analyst at Forrester Research.

These dimensions, Bartels explained, include replacing on-premises applications with software as a service (SaaS) models or single host applications, cloud middleware, and cloud infrastructure, in which compute and storage resources are accessed by a cloud provider.

However, since public cloud options are not a one-size-fits-all solution for every industry, vertical-specific cloud solutions are surfacing. These vertical cloud solutions, also known as industry clouds, are experiencing significant growth.

It’s easy to see why. Cloud applications made for specific industries are both cheaper and more efficient than other on-premise or general-cloud options, said Ed Anderson, research vice president and distinguished analyst at Gartner.

“[The cloud] has been about data center consolidation and efficiency,” Anderson said. “It’s been about moving applications to the cloud, where I can pay for consumption of cloud services, which is less expensive than trying to do it all on my own. And some of that expense is in the form of a physical environment to run your own applications. You can outsource the management of those systems to the cloud. Sometimes it’s about staying current and having the latest features and those are pushing toward the cloud.”

The industry cloud is almost inevitable for many industries, especially those using legacy vendors, Bartels added. Many legacy vendors are pushing organizations to move away from old systems and become more cloud-like, to keep up with the changing business tech environment.

Below are five industries seeing the largest investments in industry cloud solutions.

The majority (84%) of global purchase influencers in North American manufacturing firms confirm that increasing the use of cloud is a moderate, high, or critical priority over the coming year, according to Forrester Research.

Most on-premise technologies first rose in manufacturing, Bartels said. With the rise of industry cloud, however, core transactions in manufacturing are moving to the cloud. These core transactions include “the systems that are used to run the factory lines to handle the inflow of parts and materials, which are going into production...and the feeding of the end product that goes into systems for delivery or for sales to customers,” Bartels added.

With automation predicted to take over the manufacturing industry by 2024, this field is ripe with digital transformation.

Vertical cloud solutions also have great success in the retail industry, mainly due to the massive amounts of data that this industry generates, Anderson said.

Some 77% of global purchase influencers in North American retail organizations cited the increasing use of cloud as moderate, high, or critical priority over the coming year, Forrester Research determined. With such a large volume of data, retailers need to scale up on data storage, collection, and organization practices.

Industry cloud makes a huge impact on core retail management systems, particularly around the cycling of goods and inventory, Bartels said.

“These systems help manage the inflow and outflow of goods that a retailer has, and how that flows through their own distribution system of stock that’s in warehouses, versus stock that’s on trucks, in stores, or has just been sold,” Bartels continued. “These systems keep track of those stock levels, and make sure that there is a flow of goods in to replace what’s going out to the customer.”

Cloud technology also helps track business performance of various retail stores and outlets, based on whatever factors the companies want, improving efficiency, sales, and customer satisfaction, Anderson noted.

Perhaps the most prominent of the industry clouds, according to Anderson, is government clouds.

“You see it mostly in North America, but there are other examples in other countries where you either have hyper-scale providers who provide a specific government version of the cloud, or you’ll have a country provider offering some form of a focused government or country-specific cloud,” Anderson said.

These clouds help alleviate the isolation of workloads, working as a closed community, which guarantees no classified data will leave the country. Users need to receive specific permission from the government to host workloads on a government cloud, Anderson said.

Another hotbed for data management and storage occurs in healthcare. According to Forrester Research, 74% of healthcare global purchase influencers in North America said that the demand for cloud use is a moderate, high, or critical priority in the coming year.

Healthcare industry clouds allow for a central, secure place to store information, which is critical in an industry that houses many personal records.

Cloud computing can also help healthcare professionals learn about patients by tracking and keeping data about patients’ care, behavior, and health progression, said Anderson. With this information, health professionals can look at success rates and correlating scenarios, certain drug reactions, and other insights, he added.

The agriculture sector has seen great success in innovation, with movements in the internet of things (IoT) and big data helping farmers learn more about their environment and crop production. These technologies, paired with an industry cloud, can yield extremely powerful insights for farms and agriculture giants.

“In the case of IoT plus cloud, that’s where you’re going to see [agricultural] manufacturing really exploit the capabilities of cloud,” Anderson said. “Any place you can put a sensor that can capture information about its environment—soil sensors, machine sensors, seed or grain sensors, sensors around animals—the cloud can help you process it.”

With the majority of organizations moving business-critical applications and processes to the cloud, many are beginning to move outside of cloud giants like Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform, and toward industry cloud services and vendors, according to a TechRepublic CIO Jury poll.

Industry cloud services operate within a vertical space, focusing on specialized processes with tools, technologies, and business services tailored to a specific industry, and are managed by vendors that aim to understand the specific needs of a given industry.

We polled TechRepublic’s CIO Jury to learn more about the spread of industry cloud. When asked “Is your organization using industry cloud services?”, eight tech leaders said yes, while four said no.

“We use industry cloud services and we have engaged clients in more industry-based cloud solutions,” said Kris Seeburn, an independent IT consultant, evangelist, and researcher. “We have observed closely as well that, to capture this growth, cloud vendors have increasingly shifted their horizontal capabilities to form industry cloud solutions, while industry clouds themselves have created consortiums of collaboration to drive industry innovation.”

Healthcare has led other verticals toward this trend, with finance, manufacturing, and retail catching up, Seeburn said, and they are learning from their successes and failures in the cloud space to find the best path.

“Despite the telecommunications challenges we face due to geography, industry cloud vendors are key to delivering digital banking services,” said John Gracyalny, vice president of digital member services at Coast Central Credit Union. “This includes internet and mobile banking, personal financial management, bill pay, account-toaccount and person-to-person payments, and remote deposit capture. This has become the standard delivery mechanism in financial services.”

Michael Hanken, vice president of IT at Multiquip Inc., said his organization uses a vertically integrated ecommerce solution.

Simon Johns, IT director for Sheppard Robson Architects LLP, said his firm uses a number of architectural- and construction-specific services to help with collaboration and operating within its supply chain.

“Cloud-based SaaS products are a recent phenomenon in the legal industry, and finally are bringing a much needed transformation to a lagging vertical,” said Shawn Lehocky, chief strategy officer at Pond Lehocky Stern Giordano. “In the past few years, we have implemented a cloud-based product called Litify, which has transformed our entire operation. For the first time ever, we have seamlessly integrated all aspects of our business and now have the ability to use structured data as an asset to make quick informed decisions.”

In the education space, Concord University has recently implemented systems using industry cloud vendors to assist with managing the school’s admissions department and upcoming student health center. “We benefit from the products being uniquely well designed for their specific purpose and with legal/regulation compliance,” said Chuck Elliott, vice president of IT and CIO of Concord University. “We find them to be costly to our smaller budgets but we appreciate the value they bring.”

The Chicago Symphony Orchestra also uses industry cloud services, said Daniel Spees, director of information services for the orchestra. Spees said this is because of “ease of implementation compared to trying to bring up the same service in our Azure or AWS space.” Some examples of the industry cloud services the orchestra uses include Zendesk, Workfront, Adaptive Insights, ADP Workforce Now, Artsvision, and Inspired e-Learning.

Among those organizations that do not use industry cloud services, “the level of benefits offered by such solutions must overcome the risks and costs associated with the vendor lock-in,” said Flo Albu, chief digital strategist at Utility Computing Ltd. “This, coupled with a traditional risk adversity across the Utility/energy sector, means that as far as levels of adoption are concerned, I can see these solutions still in an incipient stage,” Albu said.

For more information, check out Why it’s a good time to find an ‘Industry Cloud’ dance partner on ZDNet.

Chuck Elliott, vice president of IT and CIO, Concord University

Lance Taylor-Warren, CIO, Community Health Alliance

Craig Lurey, CTO and co-founder, Keeper Security

Simon Johns, IT director, Sheppard Robson Architects LLP

Michael Hanken, vice president of IT, Multiquip Inc.

Shawn Lehocky, chief strategy officer, Pond Lehocky Stern Giordano

Jeff Focke, director of IT, Shealy Electrical Wholesalers

John Gracyalny, vice president of digital member services, Coast Central Credit Union

Kris Seeburn, independent IT consultant, evangelist, and researcher

Flo Albu, chief digital strategist, Utility Computing Ltd.

Madhushan Gokool, IT and data protection manager, Storm Model Management

Daniel Spees, director of information services, Chicago Symphony Orchestra

Want to be part of TechRepublic’s CIO Jury and have your say on the top issues for IT decision makers? If you are a CIO, CTO, IT director, or equivalent at a large or small company, working in the private sector or in government, and you want to join TechRepublic’s CIO Jury pool, email alison dot rayome at cbsinteractive dot com, and send your name, title, company, location, and email address.

Healthcare delivery organizations are still worried about security, but not so much that hospital CIOs and CTOs are avoiding cloud technology.

In a recent research report on cloud services in the healthcare sector, Gartner analyst Gregg Pessin reports that, “Healthcare CIOs are becoming more comfortable with the public cloud as an option than in the past, and have begun to adopt cloud-based solutions where the benefits are clear and the risks are acceptable.”

The idea of the cloud as an extension of internal infrastructure has helped healthcare CIOs understand the best uses of cloud technology and increased adoption rates in the sector.

The healthcare sector is under tremendous pressure to operate in real time and to provide easy access to data in multiple locations. Cloud services will help healthcare delivery organizations accomplish this transformation.

We talk with hospital leaders and technology executives to understand how the healthcare industry is using cloud computing to modernize business practices.

Gartner organizes cloud computing companies into four tiers:

Amazon, Microsoft Azure, Google, and IBM

Atmosera, Green House Data, Healthcare Blocks, and Virtustream (a Dell Technologies Business)

Atlantic.Net, Netgain Technology, NTT Data, and HIPPA Vault

Datica and UKCloud Health

There is a role for both large providers and smaller ones to help the healthcare sector make the digital transition. Large cloud computing providers have superior computing power but not the industry expertise and dedicated support to work with healthcare clients, according to Gartner analysts Gregor Petri and Anurag Gupta. This creates a significant opportunity for managed service provider partners. Smaller cloud computing providers can work with Amazon and Microsoft to build and deliver services while establishing direct relationships with healthcare stakeholders.

Smaller providers also can help with implementation and ongoing management of cloud-based applications. In addition, these providers also can HIPAA expertise to satisfy the regulatory requirements that healthcare providers must meet.

For Phil Misiowiec, the Chief Technology Officer of Healthcare Blocks, most of his clients already have a cloud strategy in place when they contact him. Misiowiec said systems being deployed to the Healthcare Blocks platform fall into one of three buckets:

New products developed by healthcare startups, either a service for patients or a value-add service for healthcare providers or insurers

New products or pilots developed by mid-to-large healthcare organizations, who are evaluating a cloud strategy

Legacy systems being cloud-enabled by being ported entirely to the cloud or deployed in a hybrid manner

Misiowiec said security, regulatory compliance, and cost are the most common concerns among his clients. “Smaller organizations tend to focus on the last one, whereas more mature organizations focus on the first two,” he said. “Organizations also fear runaway costs, based on the complexity of infrastructure-as-a-service vendors’ pricing models.”

Healthcare Blocks is a HIPAA-compliant application hosting platform used by healthcare technology startups, hospitals, and labs. The company is an AWS partner.

Novant Health’s recent cloud migration is an example of a legacy system being cloud-enabled. Earlier this year, Novant moved its Epic electronic health record system to the cloud after three months of planning and six months of implementation. Novant uses Virtustream as an infrastructure as a service provider, while the internal IT team manages the EHR application.

Based in North Carolina, Novant serves patients in four states at 640 hospitals, clinics, and physician practices. James Kluttz is a VP and chief technology officer at Novant and A.J. Patefield, MD, is an SVP and the chief medical information officer. Kluttz said that he and Patefield worked together very closely on the recent cloud migration. Collaboration is a standard operating procedure for the two colleagues to ensure technology projects support the overall medical and business strategies.

Patefield said this approach means sharing the risk of changing how the hospital’s most mission-critical system works.

“When James says, ‘I’m going to move this to the cloud,’ we go back and forth on timelines and testing,” Patefield said. “I can then go back to the doctors and assure them that James has taken into account the clinical risks and potential impact.”

Novant has a clinical informatics group in addition to a robust EHR governance group that includes healthcare specialists from all over the hospital: Doctors, nurses, respiratory therapists, and pharmacists.

“We have 16 guiding principles that we use in making decisions around the system,” Patefield said. “Every change that impacts what a nurse does goes before a leadership group before it is implemented.”

Before moving the Epic EHR to the cloud, the hospital updated the system once a year. Now that Novant’s installation is in the cloud, it’s much easier for the IT team to support Epic’s new quarterly update schedule.

Imprivata is partnering with a big cloud player--Microsoft--to create a solution to fit the unique needs of the healthcare industry. Imprivata provides identity management to hospitals. Imprivata’s appliance sits within a company’s network domain and connects to all the services within a hospital’s IT infrastructure.

When a doctor or nurse taps a badge, Imprivata checks permissions in Active Directory as well as in healthcare applications that are not connected to Active Directory, such as software unique to the cardiology or radiology department.

“If you don’t have those accounts linked, there can be orphan accounts in the PACS system or the cardiology system, and a person who doesn’t have an Active Directory account can still have access to that system,” said Imprivata CTO Wes Wright. “Our software makes sure that a particular identity has access to the data that is it supposed to have access to.”

Imprivata’s identify management expertise also has helped doctors manage the new rules around opioids. The US Drug Enforcement Administration requires two-factor authentication when a physician writes a prescription for an opioid. Imprivata has embedded this process into the electronic health record workflow.

“We try to make the tech as transparent as possible for the provider and to remove as many clicks as possible,” he said.

In April 2019 Imprivata announced a partnership with Microsoft to expand the services included in a single sign-on process. In addition to giving doctors and nurses access to healthcare information systems, Healthcare Seamless SSO allows badge-tap access to Office 365 and any application connected to Microsoft Azure Active Directory. This eliminates the need for users to type usernames and passwords each time they need to access a particular application.

“Much of the Office 365 stuff wasn’t being used because it was hard to get to,” Wright said. “With this partnership, a single badge tap can get them into their line of business applications and the 3,000 applications that Microsoft has in the Azure marketplace.”

Wright said that the hyperscale cloud vendors benefit from an economy of scale that individual health systems can’t match. “Microsoft spends $10 billion a year in cloud ops security, and there is no way that a healthcare organization can commit that much money to security,” he said.

Hospitals and physician practices are still in the early stages of the digital transformation into “real-time health systems.” Gartner analyst Gregg Pessin predicts that these “real-time healthcare delivery organizations” will expand the use of automation, analytics, location and condition sensing, event-driven technologies, interoperability, and mobility. This means that the public cloud will play a more significant role in delivering enterprise IT services.

Misiowiec of Healthcare Blocks sees the cloud as an important tool in the industry’s transformation as healthcare moves “outside the hospital walls.”

“Cloud services support the security, auditing, and operational efficiency requirements needed by telemedicine apps, patient engagement tools, and IoT devices,” he said. “Cloud services are more cost effective and efficient than using on-premise or local data centers.”

Kluttz of Novant said that moving the EHR to the cloud will position healthcare providers to start using artificial intelligence and machine learning to guide patient care.

“As our business model changes, we can continue to grow as an organization and respond much more quickly than we did in the past,” Kluttz said.

When I reviewed the banking and financial services industry’s use of the cloud in 2015 (The top cloud providers for financial services), 61% of the financial services survey respondents said that cloud was only a “formative” strategy in their business and IT plans.

Four years later, the tides have shifted as many financial services companies leverage the cloud to keep pace with a rapidly moving market. So, where exactly are banks investing in cloud?

Financial institutions continue to express reluctance in outsourcing their core banking and most of their mission-critical systems to the cloud, especially to the public cloud, where there were damaging and highly publicized security breaches.

Part of the concern relates to financial institutions’ fiduciary responsibilities to their customers. If financial and/or other highly sensitive data gets compromised, customers (and financial institutions) face major liabilities resulting from identity theft, fraud, and other malicious acts.

However, that doesn’t mean that financial services companies aren’t investing in public cloud solutions. Significant financial services engagement with public clouds has occurred in areas which promote collaboration among employees and departments, and which help financial services companies reduce the costs of their internal IT spend.

The most popular public cloud offerings for financial institutions include cloud-resident office suites such as Microsoft Office 365, customer relationship management systems (CRM), market research systems, and HR systems.

All of the above systems are ancillary to the core systems of banking, which processes banking transactions and manages customer accounts.

When it comes to mission-critical systems like bank transaction processing, account management, or overall bank portfolio management, financial services companies might still choose cloud. But if they do, it is usually in the form of an industry cloud provider that has a thorough understanding of the processes, security, and sensitivities of finance.

Smaller financial institutions such as community banks and credit unions most likely opt for an industry cloud banking solution, which can handle all of their core banking—if the provider has expertise in the financial industry and its regulations. In this case, the motivation is cost savings.

In this cloud-based banking model, it is not uncommon for smaller banks and/or credit unions to sign on with a large processor that has an internal core banking system, which can be used in a multi-tenant industry cloud. The provider of the system is often a larger financial institution looking for cost relief from its own internal IT costs and has recognized that it can easily obtain subscription money from smaller institutions that want to use its existing systems and resources in a secure cloud.

In this multi-tenant shared banking model, each financial institution has its own separate area of processing and storing data—but the cost of overall processing, data storage, telecommunications, and support are shared.

Although large financial institutions prefer to retain direct internal control over their own core processing, there are new ancillary banking products and services that consumers want. It isn’t cost effective for financial services companies to develop and deploy these products and services on their own, and in many cases, they lack the internal expertise to do so.

When time to market for new products and services also become issues, oftentimes both large and smaller financial institutions opt for cloud-based solutions run by third-party providers.

Popular additions to core financial product offerings that financial institutions often opt to outsource to the cloud include:

Pure and simple, the systems financial institutions prefer to keep under their own roofs are their mission-critical core banking systems. In general, this is true for any financial services company with more than $500 million in assets.

When it comes to both core and ancillary systems, financial institutions prefer to go with cloud providers with well-established financial and IT reputations; that can be trusted with demanding levels of governance and security; and that can provide cost-effective services that “fill the gaps” in corporate internal infrastructures and product/service offerings.

Among the cloud-based solutions that meet these criteria are:

Visa and MasterCard for card processing

Experien and TransUnion for credit checks

Fiserv and Jack Henry & Associates for cloud-based core banking services (a good fit for community banks and credit unions)

IBM and First National Technology Solutions for infrastructure as a service (IaaS)

JD Power for financial market research and analytics

Oracle HCM (Human Capital Management) and SAP/SuccessFactors for H

Salesforce for sales and customer relationship management (CRM)

Amazon Web Services (AWS) and Microsoft Azure with Moody’s Analytics, which are also being used by some large banks to run portfolio risk simulations.

Financial institutions will continue to take a measured approach toward cloud adoption. There have been too many recent data breaches that have scared consumers and make financial institutions wary.

On the other hand, financial services companies exist in a rapidly changing industry that is seeing new non-financial players enter the market. This forces companies to bring new products and services to market faster so they can retain their customers.

By leveraging the power of the cloud, financial institutions can keep pace with a rapidly moving market. They can also expand their IT infrastructures as needed to support any new offerings. A trusted cloud provider offers this elasticity in infrastructure as well as in cost.

For all of these reasons, financial services companies are opting for a hybrid IT infrastructure that incorporates elements of public cloud, industry cloud, and internal IT to optimize resources in support of their business.

Cloud utilization in the private sector is firmly entrenched -- the first cloud computing provider, Amazon Web Services (AWS), launched thirteen years ago -- yet government cloud adoption has lagged behind due to extensive requirements for vendor assessment and authorization (A&A) to ensure that vendors and products have adequate information security and risk management processes. Fortunately, a joint effort between the US Chief Information Officer and the US General Services Administration (GSA) have given government employees and decision makers FedRAMP (the Federal Risk and Authorization Management Program).

The FedRAMP website provides a standardized approach to A&A, and publishes a list of compliant and authorized vendors and services; the vendors have undergone extensive technical and security reviews, completed audits conducted by accredited third-party assessors (3PAOs), and granted authorizations to operate (ATOs). As a federal initiative, FedRAMP compliance is an easier target for vendors to comply with than standards for individual states, which generally have less stringent A&A requirements than the Federal Information Security Management Act of 2002 (FISMA). Even so, when handling privileged information in the capacity of government operations, an abundance of caution in security is preferable -- as such, FedRAMP compliance should be more than adequate for state or municipality level requirements.

Looking through the list of top cloud providers for government, you’ll notice something about the cloud products government agencies are using: They’re the same applications hosting commercial data.

The variations in cloud-based platforms certified for government use and those in the commercial world are minimal--it’s what’s going on behind the scenes that matters for government users. AWS, Salesforce, IBM, and the rest offer government products based on enhanced security needs in government computing.

The benefits for government agencies using industry cloud is largely the same as it is for commercial businesses: It reduces computing hardware needs, standardizes software, and improves collaboration.

From the current list of compliant and authorized vendors and services, these major cloud providers have a longstanding reputation of trustworthiness and competence in the private sector. These products for the government cloud sector offer similar services that are tailor-made for government use.

Amazon has obtained FedRAMP authorization for the most popular AWS offerings, including EC2, S3, Elastic Block Storage, Virtual Private Cloud, and Identity and Access Management; other AWS services can be reviewed on an individual basis for other authorizations. Amazon notes that GovCloud facilities are accessible only by US citizens, and supports FIPS 140-2 compliant end points. (An aside: The GovCloud US region uses only carbon-free power.)

Microsoft’s Office 365 and Azure Government are FedRAMP authorized, and provide the familiar Office applications that have been firmly entrenched in government and private sector work for decades.

IBM’s SmartCloud for Government services allow for eased collaboration and communication, with mail services including encryption and BlackBerry-specific support and collaborative document creation. IBM SmartCloud allows for the integration of various other cloud-enabled IBM or Lotus solutions.

Since its approval in 2014, Salesforce has taken the government computing world by storm. Salesforce is one of the most popular platforms on the FedRAMP market, and it is used by everyone from the Department of Defense to the Bureau of Engraving and Printing.

Huddle is a cloud collaboration platform that has integrations with Microsoft Office, and includes a variety of other solutions and integrations with third-party programs. Huddle is used by various UK-based governmental organizations, including the Ministry of Justice and the Commonwealth Secretariat.

Many solutions available from cloud providers are still in the process of obtaining FedRAMP authorization. While others, including OneLogin, Sumo Logic, and Snowflake Computing are working with FedRAMP to get ready to receive compliance. Compliance checking for open-source packages is also a future possibility, though none are presently undergoing an evaluation.

The corporate culture of companies whose core competency is contracting -- not technology -- can be an encumbrance to a cloud deployment. Companies such as the Canadian CGI Federal, the organization responsible for the botched launch of the HealthCare.gov platform, have been criticized by commentators for excessive charges for solutions that do not work as specified. Tech vendors expanding into government contracting and government contractors expanding into technology are two remarkably dissimilar categories.

At the same time, tech firms are not always the picture of scrupulousness. In a peculiar situation, Microsoft sued the state of Iowa for awarding a cloud services contract to Google-aligned Tempus Nova, instead of Planet Technologies, which uses Microsoft software. Tempus Nova underbid Planet Technologies by $5.1 million. Microsoft claims some requirements were waived for Tempus Nova that may have impacted the bid.

The FedRAMP website offers a wealth of resources for government buyers and team leaders to make good choices. The site is organized to show what particular modules in a given suite are authorized, see who else in the US government is using it, and get a link to the vendor’s website to learn more information.

It’s safe to assume that none of the vendors and cloud platforms listed here and on the approved list are security risks, so that shouldn’t be a concern when shopping for the right choice. What government decision makers need to plan for is not wasting time or money on the wrong product.

Industry cloud focuses on vertical solutions and integration and offers highly customized solutions to help businesses with various aspects of operations including legal, regulatory, security, and more. To better understand industry cloud’s role in the energy sector, it is important to consider the ways it is being used, the pros and cons of adoption, and which cloud providers are used most.

Industry cloud has various applications within the energy sector, though it is most commonly used for customer relationship management (CRM), providing real-time data, and hosting software.

Regarding CRM, Kelly James, vice president and general manager of energy and utilities at industry cloud software company Vlocity, explains, “There is a massive opportunity to re-define and transform the relationship between customers and utility companies. Partnerships and collaboration are going to be key in how we look at the challenges of creating differentiated ways of working, harnessing the changing energy landscape, addressing increasing customer centricity, innovation, digitalization, and operational excellence.”

James continues, “In the face of rapidly rising customer expectations and disruptive technologies, utility company CIOs and CCOs are asking themselves questions such as: ‘How do I exceed customer expectations while keeping pace with disruptive industry change?’ ‘Can I transform my customer experience without the risks that come with multi-vendor integration and with major changes to my CIS and billing systems?’ ‘How can I bring new offers and products to market while ensuring core meter to cash processes remain stable?’”

To address these and other challenges of a rapidly growing market, many energy companies are turning to the industry cloud because it provides a way to improve CRM and allows a digital transformation strategy to be put into place. According to Vlocity, “There aren’t many [in the energy sector] that we know of doing industry cloud. Most are [using] on-premise software. Having a solution designed specifically for the industry--one that delivers value today and can flex and scale for tomorrow--will allow for continual growth, agility, and differentiation, and the path to a bright future.”

The industry cloud is also being used to provide real-time data about energy consumption. In an Integrated Environmental Solutions article, IES Media & Communications Manager Suzanne Wallace writes: “One of the biggest factors in the role the cloud has across the energy sector is its ability to provide real-time data. This allows citizens and businesses to ensure they use energy in the right place, at the right time, and that they pay the right price.”

This is echoed by Maryanne Steidinger, head of marketing at Webalo, who notes the role the cloud plays in hosting software. “The cloud is used in the energy industry for, among other things, hosting software applications that the energy companies can use to gather real-time data for analysis, maintenance, and productivity,” says Steidinger.

Steidinger also explains, “For companies that have multiple locations, or even have geographically dispersed plants, the IT infrastructure costs of maintaining these disperse applications becomes much more cost effective by hosting on a cloud--either in-house ‘on premises’ or external to the company ‘off premises’.”

Adoption of any industry-based technology has potential advantages and disadvantages. Will Whatton, senior manager of digital transformation and management at the accounting and advisory organization Grant Thornton LLP, outlines some of the pros of using the industry cloud in the energy sector. Whatton states that the benefits of adoption include increased security, reduced complexity, and cost savings.

According to Whatton, “enterprise cloud computing service providers employ large teams of professionals dedicated to the security and protection of their platform. These companies invest significantly more dollars into their infrastructure versus what an individual customer could invest.”

Whatton continues, “from a complexity perspective, the migration to the cloud is also helping offset compliance and support needs for many public companies, reducing their internal time and effort focused on SOX or other types of compliance requirements.”

“From a cost perspective, customers are not only saving on the capital cost of servers and hardware, but also the soft cost of not requiring a team of network/server engineers to support their IT infrastructure,” Whatton explains. “These costs are often shifted to data analytics or data scientists to leverage the almost immediate increase in data.”

Disadvantages to cloud computing tend to deal more with cultural adaptation. As explained by Vlocity: “You have to make sure your executive team, your IT team, etc., are brought into the change and that they know how best to make the change. You can’t move away from being the energy company you are. You may need to move as quickly as Amazon or Uber, but the specific customer needs are very different.”

Vlocity suggests energy companies give customers more choice and to “help them make decisions on energy-efficient appliances and know which customers have them. But don’t try to be a retailer or gig economy company. These are lifetime customers in most cases, after all.”

It may come as no surprise that Microsoft Azure, Amazon Web Services (AWS), and Google Cloud Platform are the top cloud providers in the energy sector. A recent report (PDF) by network analytics company Kentik surveyed 388 executive and technical respondents at Cisco Live 2019 and found that the majority (59%) of the energy sector uses Azure, while 44% use AWS, and 11% use Google Cloud.

The Kentik survey also found that, while 41% of the energy sector only use one cloud, 33% use two cloud providers, indicating that the sector is increasingly making the move to multicloud.

According to Vlocity, Salesforce also provides CRM for several industries, including the energy sector. More specifically, Vlocity partners with Salesforce to “bring industry-specific SaaS software for CRM and customer experience to our customers. Energy is one of our six verticals.”

Australian construction firm PBS Building, formerly known as Prestige Building Services, recognised after years of using disjointed systems -- resulting in the double handling and duplication of data during the lifecycle of its construction projects -- that it was time for the company to implement a new solution.

“We made the decision to really look at the way we operate in terms of how we use our systems, and to redefine how we operate by using technology to manage our processes,” said PBS Building chief operating officer Matthew Rayment.

Prior to introducing a new system, the 30-year construction firm assessed the friction points that needed to be addressed. According to Rayment, six main problems were identified, and two of those were directly related to financial reporting and forecasting, and the flow of information between projects and project teams.

Following this, PBS went through the process of assessing different providers, and one of those vendors was cloud-based construction management software application provider Procore.

“We heard they were coming into the Australian market and were very successful in America, and were doing things slightly different to other technology providers, so we engaged with them and went through a fairly extensive trial period to pull apart their application,” Rayment said.

“It was very important for us that whatever system we implemented managed to fit in how we operate and how we work. We didn’t want to change the way we operated just for a system.”

Following a rigorous 12-month trial where Procore was used for the whole lifecycle of five different constructions projects, PBS signed an enterprise agreement with Procore last November.

Rayment said since introducing the cloud software, PBS no longer needed to “print and dump” financial reports created in its Sage cloud accounting software onto Excel spreadsheets to manipulate the data, before moving it back into Sage again, eliminating days of manual administrative work for PBS.

“That flow of information now happens directly from Sage to Procore, so it’s saving us lots of time from manually dumping data into Excel, which can be fraught with issues. We wanted to move away from Excel and Procore facilitated part of that transition,” he said.

“We now enter that data into Procore and it automatically pushes it into the financial system. It removes the team’s need to entering data multiple times to complete their day-to-day activities.”

Additionally, Rayment said for the first time that PBS could now manage its construction projects on the field.

“Procore’s mobile application enables us to take the software to the field, which is where we operate most of the time,” he said.

“Being able to take all the information, drawings, inspections and financial reporting out to the field and manage it on-site has really driven efficiencies.”

However, the implementation process was not all smooth sailing. Rayment pointed out how there was some initial apprehension about a new software being introduced to the PBS workforce, but the company has been able to overcome this by introducing best practice.

“Some people’s reaction was, ‘oh, here’s another software we need to learn about’, but it ended up being reasonably well received as people started to use the package more,” he said.

Rayment believes there’s still a “long way to go before full adoption and best practice is in use”, predicting that businesses will experience major gains in the next 6-12 months.

Hospitals and health systems are using cloud services to power a digital transformation, but pharmaceutical companies are using the cloud to revamp their business operations in even more fundamental ways.

Computational drug discovery uses a combination of cloud computing and artificial intelligence to make the drug development process faster and cheaper. The big drug companies are taking advantage of improvements in AI and the computational power of the cloud to test this new approach. Pharma companies are using this tech-driven process to develop traditional medications as well as completely new categories that work at the level of DNA and RNA to stop disease. Hyperscale cloud providers are vital new partners in this form of drug development.

To understand why this is so revolutionary for the pharma industry, you have to understand how the process works now in the US. It is slow, risky, and expensive.

When a pharmaceutical company wants to develop a new drug, the research team picks a condition and a likely molecule and starts exploring possibilities. Once a company has a promising compound, the clinical trial process starts. There are four phases, and new medications have to complete each phase successfully to win FDA approval. The process is long and expensive. Depending on the type of drug being tested, phase 2 trials can cost anywhere from $7 million to $19 million, and the budget for phase 3 trials are even higher: $11.5 million to $52.9 million. Only about 13% of drugs that start the process make it to the drugstore.

Researchers use computational modeling early in the drug development process to increase their chances of success; they are using modeling to identify which drugs will be safest for patients and have the fewest side effects. By making smarter choices at the start of the development process, this increases the chances that a new drug will be effective as well as an improvement over existing products.

This is where the cloud comes in. Drug companies need the computing power that hyperscale cloud companies can provide and the ability to scale operations up and down quickly. Amazon Web Services (AWS), Alphabet (Google), and Microsoft are working with established drug companies as well as startups to power this new approach to drug development.

AWS is a central element in the drug research, development, and production processes at Moderna. The company is creating a new class of treatments by using messenger RNA or mRNA, which uses the instructions in DNA to build the proteins in all human cells. Medicines built with mRNA can tell the body to build certain proteins to treat or prevent a particular illness. Moderna has received funding from the military to develop treatments for infectious diseases and from Merck and AstraZeneca to develop personalized cancer vaccines.

“Messenger RNA drugs tell the patients’ bodies how to produce the drugs themselves, sort of like biologic software,” said Dave Johnson, director of informatics at Moderna Therapeutics.

The company’s mRNA platform uses cloud-based computational capacity to run various algorithms to design each mRNA sequence. Moderna uses Amazon Elastic Compute Cloud (EC2) with Auto Scaling, Amazon EC2 Spot Instances, the Amazon Relational Database Service, and Amazon Simple Queue Service (SQS). Amazon EC2 instances pull the jobs, process the work, and use Amazon SQS to return results to the cluster master.

With AWS, Moderna can shorten the time needed to advance drug candidates to clinical studies and produce treatments that would have been impossible even a few years ago.

Partnerships have always been part of the drug development process, but now there is a new entity in the mix: Hyperscale cloud providers. In 2017, Microsoft announced a technology development alliance with Parexel, a global biopharmaceutical services organization. The companies combined Microsoft’s global cloud infrastructure with Parexel’s clinical and regulatory technology domain expertise.

Also, Microsoft was an early stage funder of Cloud Pharmaceuticals, a drug discovery company that launched in 2011 with technology initially developed at Duke University. The company’s tech platform called Quantum Molecular Design uses a combination of artificial intelligence, advanced quantum chemistry, and cloud computing to identify the most promising candidates for new small-molecule treatments.

“It is estimated that the traditional discovery process to arrive at a clinical candidate molecule takes greater than 5 years,” said Don Van Dyke, COO of Cloud Pharmaceuticals. “Cloud has consistently been able to reduce that to a matter of a few months.”

About a year ago, Cloud Pharmaceuticals announced a partnership with GlaxoSmithKline. GSK identifies the conditions it wants to focus on, and Cloud Pharmaceuticals will use its tech platform to research and develop the treatments.

Never one to miss a chance to disrupt an old-school industry, Alphabet is also using AI to speed up the drug development process. Alphabet acquired the London-based startup DeepMind in 2014 “to tackle some of our most pressing real-world challenges,” including the slow drug development process.

The health team at DeepMind is using AI to understand protein folding. Almost every function in the body is guided by the shape and movement of proteins. When proteins become tangled or deformed, this can lead to various diseases, including diabetes, Parkinson’s and Alzheimer’s. If researchers had a tool to accurately model protein structures, this practical application of AI could speed up the development of new drugs.

In late 2018, DeepMind entered one of its products -- AlphaFold -- into a protein-folding competition that attracts researchers from around the world. Research teams must predict the structures of proteins from lists of specific amino acids, which are sent to teams every few days over several months. AlphaFold beat 97 other entrants. The algorithm predicted the most accurate structure for 25 out of 43 proteins, compared with three out of 43 for the second-place team in the same category.

British researcher Liam McGuffin led the highest-scoring UK academic group in the competition. In an article for The Guardian, he said about DeepMind: “The ability to predict the shape that any protein will fold into is a big deal. It has major implications for solving many 21st-century problems, impacting on health, ecology, the environment and basically fixing anything that involves living systems.”

Predicting protein-folding is particularly complex given that the human body can produce anywhere from 10,000 to a billion different proteins. Proteins are made of chains of amino acids, of which there are 20 types. A protein with hundreds of amino acids can form a staggering number of different structures -- around a googol cubed.

It’s easy to see where cloud computing comes in to help researchers and pharmaceutical companies analyze and understand this volume of data to develop new treatments.