Cognitive technologies for health plans

Using artifical intelligence to meet new market demands

A Deloitte series on cognitive technologies

Deloitte University Press

Deloitte Consulting LLP's Enterprise Science offering employs data science, cognitive technologies such as machine learning, and advanced algorithms to help create high-value solutions for clients. Services include cognitive automation, which uses cognitive technologies such as natural language processing to automate knowledge-intensive processes; cognitive engagement, which applies machine learning and advanced analytics to make customer interactions dramatically more personalized, relevant, and profitable; and cognitive insight, which employs data science and machine learning to detect critical patterns, make high-quality predictions, and support business performance. For more information about the Enterprise Science offering, contact Plamen Petrov (ppetrov@deloitte.com) or Rajeev Ronanki (rronanki@deloitte.com).

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Executive summary

IN a rapidly changing health care market, health plans are being challenged to become more efficient, operate with greater insight and effectiveness, and deliver better service. Many are reassessing their strategies and business models. An emerging set of information technologies called *cognitive technologies* is offering health plans new and powerful ways to meet these challenges. Cognitive technologies can help reduce costs by automating tasks, such as reviewing prior authorization requests and de-identifying patient care records, which have historically required human judgment to perform. They can also help improve population health by yielding analytical insights into patterns of illness and individual behavior; combat fraud, waste, and abuse through more sophisticated fraud detection capabilities; and enhance customer service by enabling virtual agents to interact with individuals using natural language. Health plans can identify opportunities to apply cognitive technologies at their organizations by looking for processes that could be automated using these technologies; examining staffing capabilities to identify areas where cognitive skills and training may be underutilized; identifying data sets that may be insufficiently exploited; and conducting a market analysis to reveal opportunities to differentiate the organization through automation or performance improvement.

An emerging set of information technologies called *cognitive technologies* is offering health plans new and powerful ways to meet these challenges.

This article is part of a Deloitte University Press series on the business impact of cognitive technologies.

Health plans are navigating major trends

THE impact of the 2010 Affordable Care Act continues to be felt across the US health care system. No segment of the industry may be affected more than health plans. The forces reshaping the landscape for health plans include:

- Rising retail consumerism as individuals seize greater control of their health care
- Growing interest in value-based care models from health systems, providers, and health plans[1]
- An increasing focus on transparency and quality
- Intensifying competition, both from incumbent plans and from new players such as provider-sponsored plans

As a result, health plans are being challenged to:

- Market themselves more effectively to consumers
- Provide better customer service to members
- Actively understand, manage, and improve their members' health
- Manage operating costs, financial performance, and health outcomes in a much more dynamic environment

An emerging set of information technologies called cognitive technologies offers health plans new ways to meet these challenges.

Cognitive technologies can enable organizations to break trade-offs

IT is now possible to automate tasks that are usually assumed to require human perceptual or cognitive skills, such as recognizing handwriting, speech, or faces, understanding language, planning, reasoning from partial or uncertain information, and learning. Technologies able to perform tasks such as these, traditionally assumed to require human intelligence, can be called cognitive technologies.[2]

A product of the field of research known as artificial intelligence, cognitive technologies have been evolving over decades. Businesses are taking a new look at these technologies because they have improved dramatically in recent years, with impressive gains in machine learning, computer vision, natural language processing, speech recognition, and robotics, among other areas. (Figure 1 depicts widely used cognitive technologies.)

Figure 1. Widely used cognitive technologies

Source: David Schatsky, Craig Muraskin, and Ragu Gurumurthy, *Demystifying artificial intelligence: What business leaders need to know about cognitive technologies*, Deloitte University Press, November 4, 2014, http://dupress.com/articles/what-is-cognitive-technology/.

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In a study of over 100 applications and pilots of cognitive technologies across 17 sectors, we found that these applications fall into three main categories, as indicated in figure 2. Organizations can use cognitive technologies to enhance their products or services; they can use them to automate their processes; and they can use them to uncover insights that can inform operational and strategic decisions.[3]

Cognitive technology applications of each type—product, process, and insight—are already providing business benefits to some health plans. Because cognitive technologies extend the power of information technology to tasks traditionally performed by humans, they have the potential to enable organizations to break prevailing trade-offs between speed, cost, and quality.[4] For this reason, cognitive technologies are becoming an important element of health plans' technology strategies. Figure 3 gives some examples of potential applications of each type of cognitive technology at health plans.

Figure 2. Three categories of application of cognitive technoloiges

Graphic: Deloitte University Press | DUPress.com

Figure 3. Ways that health plans can use cognitive technologies

Technology	Sample applications for health plans
Automated planning	Choosing and sequencing interventions for care management
Automated reasoning, knowledge representation, hypothesis generation	Analyzing documents and making recommendations (for instance, reading clinical guidelines and policy documents to recommend appropriate and permissible treatments)
Computer vision	Enabling telehealth; supporting medication compliance (for instance, using a smartphone camera to provide automatic remote analysis of skin conditions or to visually recognize pills)
Handwriting recognition/optical character recognition (OCR)	Digitizing handwritten prescriptions, treatment requests, or clinical notes for further processing
Machine learning (discovering contextually relevant insights from multiple sources of data)	Numerous applications, including identifying claim fraud patterns, predicting disease risk, recommending health plans likely to appeal to certain customers, and learning consumer preferences from interactions and data
Natural language processing	Processing and understanding unstructured textual information including clinical and policy guidelines or clinical notes
Optimization	Optimizing provider networks for affordability, access, and quality
Speech recognition	Enabling customer self-service using natural speech

Applications of cognitive technologies span major health plan functions

RESEARCHERS and health plans have piloted and begun to implement applications of cognitive technologies in key parts of the health plan value chain to reduce costs, improve efficiency, deliver better health outcomes, and improve health plans' effectiveness as consumer marketers. Figure 4 depicts the major functions of a typical health plan and indicates where cognitive technologies are already being applied and where applications are emerging.

Managing medical costs and improving quality of care

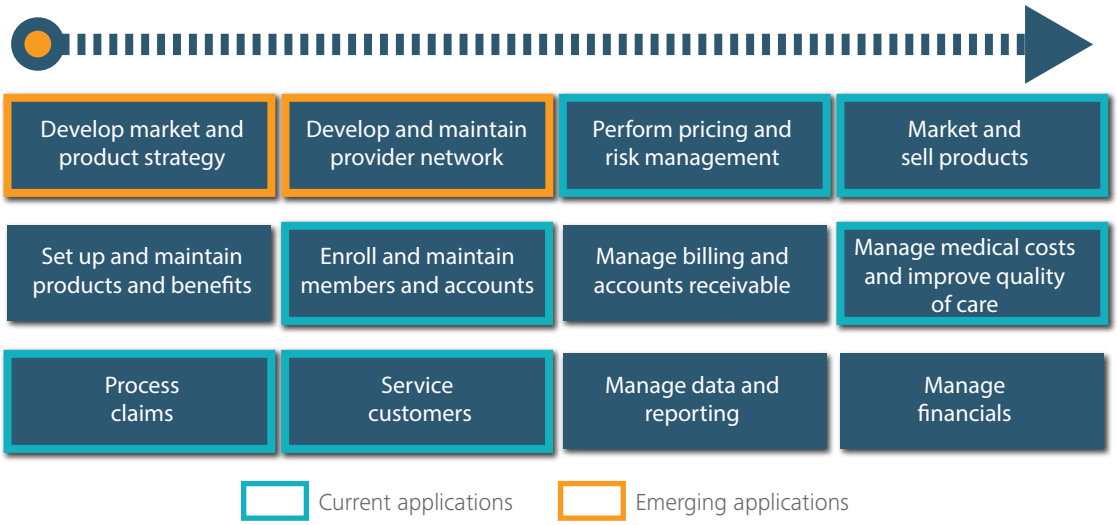
Automating prior authorization

Prior authorization, a key health care delivery process, requires medical personnel to review treatment requests, clinical guidelines, and health plan policies to decide whether a treatment request should be approved. This largely manual process is costly and time-consuming. Researchers have sought to demonstrate that this process can be automated by applying cognitive technologies. A 2013 study using data from a Brazilian insurer, for instance, applied machine learning—a cognitive analytic technology that uses sets of data to learn patterns and make predictions—to build models of the decision process for approving or denying treatment requests. The study analyzed 73 attributes of treatment requests and generated models that were able to predict, with high accuracy, whether a human medical reviewer would approve or deny treatment. The authors concluded that they had demonstrated the possibility of modeling the behavior of medical reviewers using computational techniques.[5]

A commercial-scale effort that employs cognitive technologies to streamline the prior authorization process is well underway at Anthem, a health benefits company with more than 37 million members that processes more than 550 million claims per year.[6] According to Anthem, its nurses spend some 40 to 60 percent of their time reading and aggregating information, including information on Anthem's policies, clinical research, and treatment guidelines.[7] To streamline this process, Anthem's utilization management (UM) nurses trained IBM's Watson cognitive computing system to review authorization requests for common procedures, using 25,000 test case scenarios and de-identified data on 1,500 actual cases. The system uses hypothesis generation and evidence-based learning to generate confidence-scored preauthorization recommendations that help nurses make decisions about utilization management. The new system provides responses to all requests in seconds, as opposed to 72 hours for urgent care preauthorization and three to five days for elective procedure preauthorization with the previous UM process.[8]

Other dimensions of prior authorization could also be automated using cognitive technologies. The prescription authorization process is a natural candidate, for instance. It also entails knowledge and decision-making processes that involve natural language and

Figure 4. Current and emerging applications of cognitive technologies in major health plan functions



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probabilistic reasoning, which are becoming increasingly amenable to automation with cognitive technologies. And it is costly. One pharmacy benefit manager (PBM) organization estimates that the operating costs of its prior authorization process exceed $90 million per year.[9] Another opportunity is to use optical character and handwriting recognition to automate the intake of handwritten and faxed treatment requests and other clinical documents. In light of cognitive technologies' improving performance and compelling business cases for their use, we expect to see at least some health plans using cognitive technologies to automate these kinds of processes in the coming years.

Improving population health

Another way that cognitive technologies could improve quality of care is by helping to manage and improve population health. Machine learning is a cognitive technology consisting of a family of analytic techniques that can automatically discover patterns in data. Once discovered, the patterns can be used to make predictions. Health plans can use machine learning to better understand, predict, and influence the health of patient populations.

Aetna, a leading health benefits provider,[10] and GNS Healthcare, an analytics company, provide an example. The two companies teamed up to use machine learning and other analytic techniques to improve patients' health and reduce the cost of caring for them. The analysis focused on metabolic syndrome, a condition that significantly increases the risk of developing heart disease, stroke, and diabetes. Using claims and biometric data for a population of 37,000 Aetna members, the companies developed models that predicted the risk of developing each of the five risk factors associated with metabolic syndrome. The models also looked at which specific risk factor was most influential in terms of predicting overall metabolic syndrome risk and the associated cost. The most important factor was demonstrated to be waist circumference/obesity.[11]

Based on these insights, Aetna is developing offerings for its plan-sponsor customers that make it possible to provide personalized advice and care management to plan members. The participants of one such program—a personalized weight-loss program targeted at at-risk members—achieved weight loss and cost savings in the first year.[12]

We should expect a growing number of health plans to employ advanced analytics such as machine learning techniques to better manage their members' health. Provider

organizations that take on more of the financial risk for the cost of care[13] may also find that advanced analytics techniques, including the cognitive technology machine learning, can be a valuable tool for managing population health.

Bringing insight and automation to claims processing

Detecting fraud, waste, and abuse

An important administrative application of cognitive technologies is the detection of fraud, waste, and abuse, which imposes huge costs on the US health care system. In 2011, these costs were estimated to be in the range of $82 billion to $272 billion.[14] One way to attack this problem involves adding fraud detection logic to claims processing systems. However, electronic claims processing systems that rely only on simple rules for detecting possible fraud can become out of date as fraud patterns change. To achieve more effective fraud detection, many researchers have attempted to develop more sophisticated anti-fraud approaches that incorporate analytic techniques, including machine learning.

Machine learning can be used to discover a relationship between the attributes of a medical claim—such as diagnosis, procedure, billing amount, or any of dozens of other variables—and whether a claim is fraudulent or not. Machine-learning techniques can be used to assess one claim's attributes in relation to other claims and determine how the claims are related to or different from each other. This makes it possible to derive clear sequence and association rules between claims, distinguish anomalies, or group similar claims together. In this way, machine learning can perform more sophisticated tasks than rules-based systems, including learning fraud patterns from data, calculating the "fraud likelihood" for each case to prioritize cases for review, and identifying previously unknown types of fraud.[15]

Even as health systems adopt cognitive technologies to help counter fraud, waste, and abuse, there is room for further improvement. Fraud detection systems that can automatically evolve in response to changing fraud patterns, for instance, or systems that can help reveal the causes of fraud, could assist health systems in general and health plans in particular to get a firmer grip on fraud.[16]

De-identification of patient records

The clinical information that hospitals and health plans accumulate about patients has great potential research value. However, the 1996 Health Insurance Portability and Accountability Act's (HIPAA) privacy rule imposes a justifiable burden on organizations that would use this data for research. Protected health information (PHI) that could identify a patient, such as his or her name, date, age, email address, phone number, or Social Security number, must be protected. According to the HIPAA privacy rule, patient records can only be used for research if 1) all PHI is removed through a process called "de-identification", 2) patient consent is obtained, or 3) an institutional review board grants a waiver of consent. Each of these avenues presents difficulties. Obtaining patient consent potentially reduces the amount of data available for research, as not all patients will consent. Even with a waiver of consent, managing health data can be cumbersome because information must be tracked to prevent unauthorized disclosure.[17] And manual de-identification is prohibitively expensive and error-prone.[18]

De-identification is a good application for cognitive technologies because, while not requiring deep expertise, it depends on the ability to read sometimes unstructured documents and to learn and recognize patterns in them. In fact, researchers have shown that cognitive technologies can be very useful for automating the process of de-identifying patient records. A common approach is to combine multiple cognitive technologies in a pipeline. Optical character recognition may be used to create digital versions of paper records with recognizable characters, for instance. Then, natural language processing may be used to identify key features of the text, such

as names and places. Further processing can enumerate a larger set of other features that may include the relative position of key words or phrases in a document. And machine learning techniques can be used to classify segments of text as types of personal health information, which need to be deleted or anonymized, or other information, which can remain in the final documents. The accuracy of this type of approach can be indistinguishable from that of human annotators.[19]

Automating service with cognitive technologies

Health plans face rising challenges when it comes to providing service to their members. On one hand, manual processes are costly.[20] On the other hand, in an increasingly consumer-driven market, customer satisfaction is becoming more important to health plans' financial success.[21] Cognitive technologies can help health plans address these challenges.

One example of the application of cognitive technologies in customer service is "Ann," the virtual online assistant deployed by Aetna several years ago. Aetna members who visit the secure member website can open a chat window to interact with Ann, who uses natural language processing to understand and respond to queries in natural English. If Ann fails to recognize a request, she can ask follow-up questions for clarification. Using text-to-speech and search technologies, Ann provides immediate spoken and written responses. In Ann's early years of operation, 65 to 70 percent of her responses were considered high quality, meaning that the customer was able to get the information requested solely through their interaction with Ann.[22]

Progress in cognitive technologies has helped improve the performance of such virtual agents. A recent study found that virtual customer service agents often have a 90 percent success rate in addressing customer inquiries.[23] Better performance, coupled with the growing imperative to improve customer service, is leading more health plans to deploy this type of technology. One survey of 46 health plans, representing approximately 60 percent of the 2013 commercial individual health insurance market, found that more than half of the surveyed plans intend to invest in providing virtual customer service via web chat over the next three years.[24]

The future of cognitive technologies in health plans

HEALTH plans are under pressure to become more effective marketers, to provide better customer service and greater customer satisfaction, and to operate with greater insight amid greater competition—all while lowering costs. As the examples discussed above show, cognitive technologies are already helping to address these challenges. Further, the power of cognitive technologies continues to grow: Billions of dollars in venture capital investment are supporting the commercialization of these technologies and solutions based on them.[25] Given this investment, cognitive technologies are poised to become an increasingly important part of health plans' technology strategies.

Cognitive technologies may be most widely used to perform analytic and knowledge-, language-, and perception-intensive tasks, for which cognitive technologies are uniquely well suited. Figure 5 lists a number of cognitive technology applications we could see health plans adopt over the next several years.

Market and product strategy

Savvy health plans are likely to tap the power of cognitive technologies to help guide product strategies. Machine learning techniques can be used to discover and understand customer segments and define products and service bundles that will appeal to them.

Develop and maintain provider networks

Machine learning techniques may enable health plans to design better provider networks by discovering relationships between providers and cost, fraud, and patient satisfaction, for instance.

Pricing and risk management

Cognitive analytics can play an important role in the design of value-based care plans, which require a sophisticated understanding of the drivers of cost and health outcomes in a health care system.

Marketing and sales

Health plans could employ cognitive technologies in marketing and sales processes. Tools to analyze consumer sentiment as expressed in social media, for instance—already popular in the consumer product and retail sectors—will likely be adopted by health plans. Lead generation tools that automate email interactions with consumers and flag those ready to buy may see adoption as well. Advanced analytics, including machine learning techniques, could power automated tools that can help consumers select the health plan they are most likely to be satisfied with.[26] Indeed, by 2017, 80 percent of health plans could use dynamic guided selling tools to recommend products based on consumer input.[27]

Patient engagement

There may be a compelling role for cognitive technologies in personally engaging with patients to improve the management of chronic health conditions such as diabetes and metabolic syndrome. For such conditions, one key to successful management is helping patients to consistently manage their daily activities to include therapeutically required tasks. To be most effective, care management should be personalized to each patient's lifestyle, preferences, needs, and medical specifics. One potential solution to the challenge of providing personalized care management

at scale is to collect and continuously update detailed patient information, and then to use cognitive computing to reason probabilistically about that data to make appropriate, personalized recommendations to patients and care managers. Wearable sensors, personal biometric devices, and smartphones can generate a stream of data which, coupled with other types of information such as patient history and clinical guidelines, could be processed by a cognitive system to dynamically generate insights, recommendations, and behavioral nudges to improve care management.

Figure 5. Current and emerging cognitive technology applications for health plans

Application	Applicaton type	Potential benefits
Automate prior authorization process • Automatically read and analyze treatment requests, patient clinical information, and clinical and policy guidelines • Generate preauthorization recommendations	Product Process	Faster, more consistent results Reduced staff time Lower costs
Improve care management • Identify high-risk patients • Identify effective interventions • Personalize engagement • Develop holistic view of patients	Insight Product	Higher treatment adherence Better health outcomes Lower costs
Improve population health management • Identify high-risk populations • Identify effective interventions	Insight Product	Better health outcomes Lower costs
Detect fraud, waste, and abuse	Process	Lower costs
Automate de-identification of patient records	Process	Greater privacy Faster results Lower costs
Automate member service • Enable members to interact with virtual agents using natural language • Automatically provide relevant, personalized answers to member questions	Product	Improved customer satisfaction Lower costs
Support market and product strategy • Identify customer segments • Design products tailored to segments	Insight	Better strategies Greater product relevance to consumers
Enhance provider networks/create value-based networks	Insight	Improved access to affordable, quality care Improve patient satisfaction
Manage pricing and risk • Augment actuarial capabilities	Insight	Improved pricing for value-based care Smarter management of risk pricing
Marketing and sales • Analyze customer sentiment • Automate marketing processes • Automate sales process using guided selling	Product Process	Greater customer insight Greater marketing effectiveness Personalized offerings

Next steps for health plans

HEALTH plans can take a systematic approach to identifying opportunities to apply cognitive technologies. Some key steps are:

- **Create a process map** to reveal workflows where cognitive technologies may have viable and valuable applications.
- **Review the staffing model** to identify roles where cognitive skills and training may be underutilized or where expertise is in short supply.
- **Perform a dataset inventory** to uncover operational data sets that may be underanalyzed and insufficiently exploited.
- **Conduct a market analysis** to reveal opportunities where improvements in performance or automation features are valuable to existing or new market segments and can differentiate the company's offerings.[28]

Developing appropriate technology strategies can be challenging, but it is crucial in an era of rapid change.

Health plans are facing a range of opportunities and challenges spanning strategy, business models, and operations. Developing appropriate technology strategies can be challenging, but it is crucial in an era of rapid change. Health plans can begin reviewing their technology strategies today to discover opportunities to apply cognitive technologies to enhance their products and services, automate key processes, and forge insights that can guide strategy, improve operations, and help them compete and thrive in a new era of health care.

Endnotes

1. Melanie Evans and Bob Herman, "Where healthcare is now on march to value-based pay," *Modern Healthcare*, January 28, 2015, http://www.modernhealthcare.com/article/20150128/NEWS/301289952/where-healthcare-is-now-on-march-to-value-based-pay, accessed February 17, 2015.
2. For an introduction to the concept of cognitive technologies, their improving performance, efforts to commercialize them, and the growing impact we expect them to have, see David Schatsky, Craig Muraskin, and Ragu Gurumurthy, *Demystifying artificial intelligence: What business leaders need to know about cognitive technologies*, Deloitte University Press, November 4, 2014, http://dupress.com/articles/what-is-cognitive-technology/, accessed November 9, 2014.
3. Ibid.
4. For an analysis of how companies are using cognitive technologies to create business value, see David Schatsky, Craig Muraskin, and Ragu Gurumurthy, "Cognitive technologies: The real opportunities for business," *Deloitte Review*, January 2015, http://dupress.com/articles/cognitive-technologies-business-applications/, accessed January 31, 2015.
5. F. Araujo et al., "Evaluation of the use of computational intelligence techniques in medical claim processes of a health insurance company," *Proceedings of the 2013 IEEE 26th International Symposium on Computer-Based Medical Systems (CBMS)*, June 2013, pp. 23–28.
6. Before its recent name change, the company was known as WellPoint. See: Bruce Japsen, "WellPoint name change to Anthem official, reflects brand," *Forbes*, December 3, 2014, http://www.forbes.com/sites/brucejapsen/2014/12/03/wellpoint-name-change-to-anthem-official-reflects-brand/, accessed December 21, 2014.
7. IBM, "IBM Watson on Twitter," February 8, 2013, https://twitter.com/IBMWatson/status/299898626673606656, accessed December 22, 2014.
8. IBM, "IBM Watson platform enables more effective healthcare preapproval decisions using evidence-based learning," http://www.ibm.com/smarterplanet/us/en/ibmwatson/assets/pdfs/WellPoint_Case_Study_IMC14792.pdf, accessed December 9, 2014.
9. Personal communication with company source.
10. For a ranking by market share of the top health plans, see Evi Heilbrunn, "Top health insurance companies," *U.S. News & World Report*, November 5, 2014, http://health.usnews.com/health-news/health-insurance/articles/2013/12/16/top-health-insurance-companies, accessed January 5, 2015.
11. Alison Diana, "Big data helps insurer pinpoint at-risk patients," *InformationWeek*, June 30, 2014, http://www.informationweek.com/healthcare/analytics/big-data-helps-insurer-pinpoint-at-risk-patients/d/d-id/1278947, accessed October 14, 2014.
12. Conversation with Greg Steinberg, head of clinical innovation at Aetna, January 6, 2015.
13. The shifting of risk from health plans to providers is exemplified by a recently announced pilot covering cancer care. See MD Anderson Cancer Center, "MD Anderson, UnitedHealthcare launch new cancer care payment model," December 16, 2014, accessed December 22, 2014.
14. Donald Berwick and Andrew Hackbarth, "Eliminating waste in US health care," JAMA 307, no. 14 (2012): pp.1513-6, doi: 10.1001/jama.2012.362.
15. Qi Liu and Miklos Vasarhelyi, "Healthcare fraud detection: A survey and a clustering model incorporating geo-location information," *29th World Continuous Auditing and Reporting Symposium (29WCARS)*, Brisbane, Australia (2013).
16. Ibid.
17. Louise Deleger et al., "Large-scale evaluation of automated clinical note de-identification and its impact on information extraction," *Journal of the American Medical Informatics Association* 20, no. 1 (2013), pp. 84-94, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3555323/, accessed December 16, 2014.
18. Ishna Neamatullah et al., "Automated de-identification of free-text medical records," *BMC Medical Informatics and*

Decision Making 8, no. 32 (2008), http://www.biomedcentral.com/1472-6947/8/32, accessed December 17, 2014.

19. Deleger et al., "Large-scale evaluation of automated clinical note de-identification and its impact on information extraction."
20. A 2013 study looked at six major types of administrative transactions and found a significant percentage had been conducted manually—such as by telephone or fax. The analysis found the industry overall could save billions by continuing the shift from manual to electronic transactions for these processes. See CAQH, "2013 U.S. healthcare efficiency index: Electronic administrative transaction adoption and savings," revised May 5, 2014, http://www.caqh.org/index_report.php, accessed December 7, 2014.
21. Larisa Layug et al., *Navigating coverage: How behavioral factors affect decisions in health care plan selection*, Deloitte University Press, November 21, 2014, http://dupress.com/articles/behavioral-economics-health-care/, accessed December 17, 2014.
22. Leonard Klie, "Aetna members get Ann-swers," *CRM Magazine*, October 2011, http://www.destinationcrm.com/Articles/Columns-Departments/REAL-ROI/Aetna-Members-Get-Ann-swers--77682.aspx, accessed November 26, 2014.
23. Brendan Witcher with Zia Daniell Wigder, Rebecca Katz, *The business case for virtual agents*, Forrester Research, September 30, 2014.
24. Deloitte, "Survey says . . . health plans advance retail capabilities 2014 via: Deloitte's 2013 health plan retail capability survey," http://www2.deloitte.com/content/dam/Deloitte/us/Documents/life-sciences-health-care/us-lshc-report-health-plans-advance-retail-capabilities.pdf, accessed December 22, 2014.
25. Schatsky, Muraskin, and Gurumurthy, *Demystifying artificial intelligence*.
26. One startup has already developed such a capability for use in health care exchanges. See Nathan Eddy, "Picwell launches data analytics platform for health care industry," *eWeek*, September 16, 2014, http://www.eweek.com/it-management/picwell-launches-data-analytics-platform-for-health-care-industry.html, accessed January 4, 2015.
27. Deloitte, "Survey says . . . "
28. Schatsky, Muraskin, and Gurumurthy, "Cognitive technologies: The real opportunities for business."

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