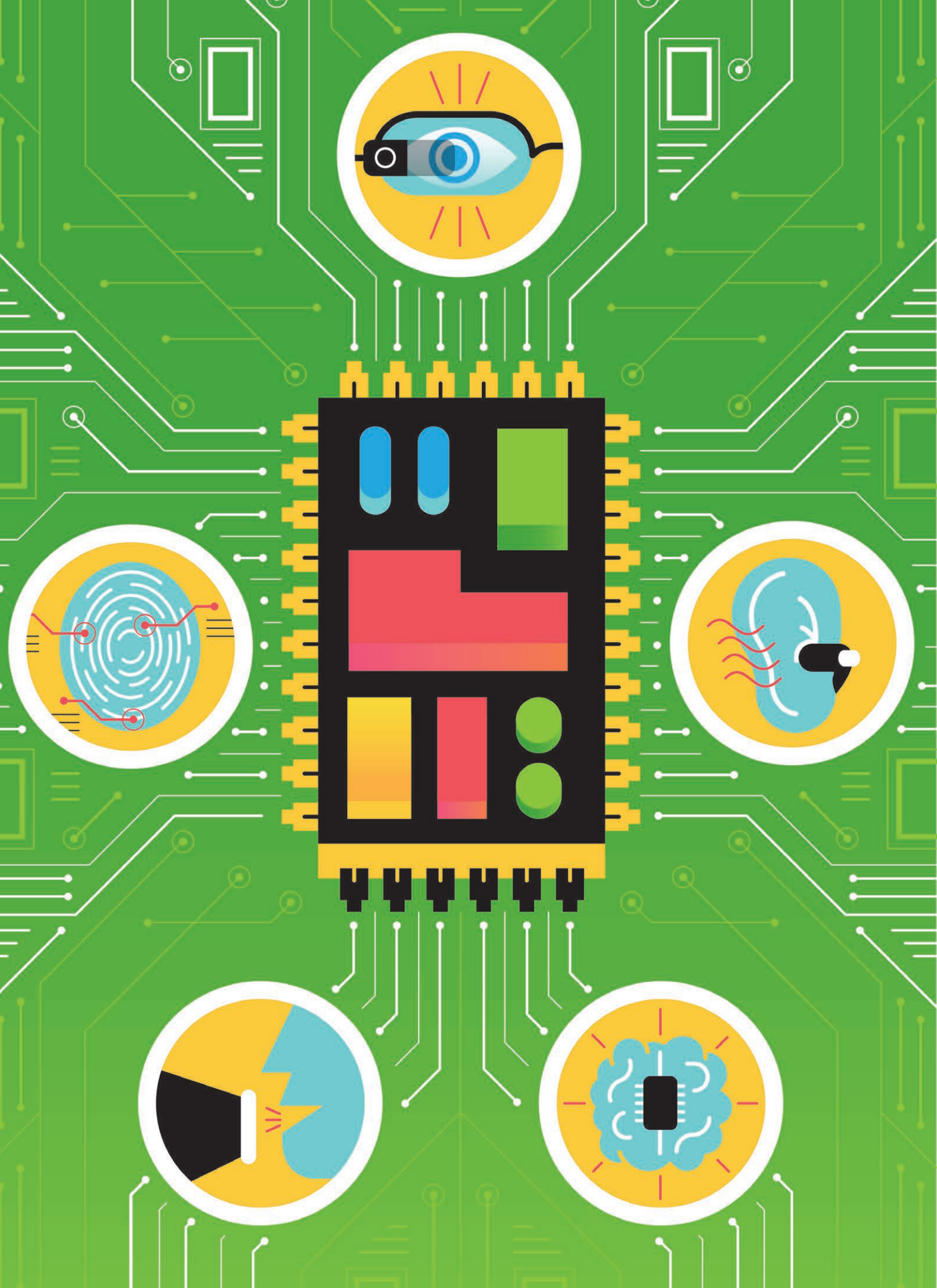


Amplified intelligence

Power to the people

Analytics techniques are growing in complexity, and companies are applying machine learning and predictive modeling to increasingly massive and complex data sets. Artificial intelligence is now a reality. Its more promising application, however, is not replacing workers but augmenting their capabilities. When built to enhance an individual's knowledge and deployed seamlessly at the point of business impact, advanced analytics can help amplify our intelligence for more effective decision making.

TODAY'S information age could be affectionately called "the rise of the machines." The foundations of data management, business intelligence, and reporting have created a massive demand for advanced analytics, predictive modeling, machine learning, and artificial intelligence. In near real time, we are now capable of unleashing complex queries and statistical methods, performed on vast volumes of heterogeneous information.

But for all of its promise, big data left unbounded can be a source of financial and intellectual frustration, confusion, and exhaustion. The digital universe is expected to grow to 40 zettabytes by 2020 through a 50x explosion in enterprise data.[1] Advanced techniques can be distracting if they aren't properly focused. Leading companies have flipped the script; they are focusing on concrete, bounded questions with meaningful business implications—and using those implications to guide data, tools, and technique. The potential of the machine is harnessed around measurable insights. But true impact comes from putting those insights to work and changing behavior at the point where decisions are made and processes are performed. That's where amplified intelligence comes in.

Open the pod bay doors

Debate rages around the ethical and sociological implications of artificial intelligence and advanced analytics.[2] Entrepreneur and futurist Elon Musk said: "We need to be super careful with AI. Potentially more dangerous than nukes."[3] At a minimum, entire career paths could be replaced by intelligent automation and made extinct. As researchers pursue general-purpose intelligence capable of unsupervised learning, the long-term implications are anything but clear. But in the meantime, these techniques can be used to supplement the awareness, analysis, and conviction with which an individual performs his or her duty—be it an employee, business partner, or even a customer.

The motives aren't entirely altruistic . . . or self-preserving. Albert Einstein famously pointed out: "Not everything that can be counted counts. And not everything that counts can be counted."[4] Business semantics, cultural idiosyncrasies, and sparks of creativity remain difficult to codify. Thus, while the silicon and iron (machine layer) of advanced computational horsepower and analytics techniques evolve, the carbon (human) element remains critical to discovering new patterns and identifying the questions that should be asked. Just as autopilot technologies haven't replaced the need for pilots to fly planes, the world of amplified intelligence allows workers to do what they do best: interpreting and reacting to broader context versus focusing on applying standard rules that can be codified and automated by a machine.

This requires a strong commitment to the usability of analytics. For example, how can insights be delivered to a specific individual performing a specific role at a specific time to increase his or her intelligence, efficiency, or judgment? Can signals from mobile devices, wearables, or ambient computing be incorporated into decision making? And can the resulting analysis be seamlessly and contextually delivered to the individual based on who and where they are, as well as what they are doing? Can text, speech, and video analytics offer new ways to interact with systems? Could virtual or augmented reality solutions bring insights to life? How could advanced visualization support data exploration and pattern discovery when it is most needed? Where could natural language processing be used to not just understand semi-structured and unstructured data (extracting meaning and forming hypotheses), but to encourage conversational interaction with systems instead of via queries, scripts, algorithms, or report configurators?

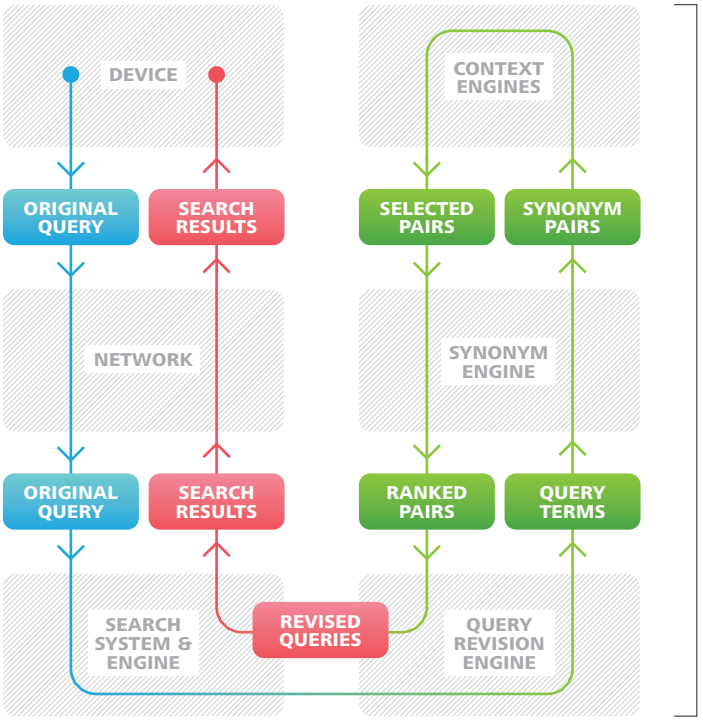
Amplified intelligence creates the potential for significant operational efficiencies and competitive advantage for an organization. Discovery, scenario planning, and modeling can be delivered to the front lines, informed by contextual cues such as location, historical behavior, and real-time intent. It moves the purview of analytics away from a small number of specialists in back-office functions who act according to theoretical, approximate models of how business occurs. Instead, intelligence is put to use in real time, potentially in the hands of everyone, at the point where it may matter most. The result can be a systemic shift from reactive "sense and respond" behaviors to predictive and proactive solutions. The shift could create less dependency on legacy operating procedures and instinct. The emphasis becomes fact-based decisions informed by sophisticated tools and complex data that are made simple by machine intelligence that can provide insights.

Bold new heights

Amplified intelligence is in its early days, but the potential use cases are extensive. The medical community can now analyze billions of web links to predict the spread of a virus. The intelligence community can now inspect global calls, texts, and emails to identify possible terrorists. Farmers can use data collected by their equipment, from almost every foot of each planting row, to increase crop yields.[5] Companies in fields such as accounting, law, and health care could let frontline specialists harness research, diagnostics, and case histories, which could arm all practitioners with the knowledge of their organization's leading practices as well as with the whole of academic, clinical, and practical experience. Risk and fraud detection, preventative maintenance, and productivity plays across the supply chain are also viable candidates. Next-generation soldier programs are being designed for enhanced vision, hearing, and augmented situational awareness delivered in real time in the midst of battle—from maps to facial recognition to advanced weapon system controls.[6]

The technology behind NLP and conversational interaction

Conversational interaction is the ability to understand and answer a string of questions in a dialogue. Analytics engines derive the structure of a query, as well as its intent, through parsing, semantic search, synonyms, and most importantly, context—building upon insight gained through previous queries and cues from behavior, surroundings, and knowledge of business processes.[a]



THE CONVERSATIONAL SEARCH PROCESS

STEP 1 The synonym and context engines receive specific query terms and generate, sort, and rank potential synonyms for these terms using database rules and previous queries.

STEP 2 The revision engine then selects and uses the synonyms to create revised queries.[b] Using synonyms and context to expand queries allows the system to offer the most relevant and useful responses to the conversation.

Sources: [a] Danny Sullivan, "Google's Impressive 'Conversational Search' Goes Live On Chrome," May 22, 2013, http://searchengineland.com/googles-impressive-conversational-search-goes-live-on-chrome-160445, accessed October 14, 2014. [b] Abhijit A. Mahabal et al, "United States Patent 8,538,984 B1: Synonym Identification Based on Co-occuring Terms," September 17, 2013, http://www.google.com/patents/US8538984, accessed October 14, 2014.

In these and other areas, exciting opportunities abound. For the IT department, amplified intelligence offers a chance to emphasize the role it could play in driving the broader analytics journey and directing advances toward use cases with real, measurable impact. Technically, these advances require data, tools, and processes to perform core data management, modeling, and analysis functions. But it also means moving beyond historical aggregation to a platform for learning, prediction, and exploration. Amplified intelligence allows workers to focus on the broader context while allowing technology to address standard rules that can be codified and executed autonomously.

All together now

The emphasis on usability and deployment moves the information agenda from isolated data scientists to multidisciplinary teams. The agenda should focus on helping end users by understanding their journey, their context, and how to enhance and reshape their jobs. Like the revolution in user engagement

that transactional systems have recently experienced, amplified intelligence solutions start from the user down, not from the data model and analytics up. To start the process with users, organizations should identify a crunchy question that, if answered, could significantly improve how a specific individual does his or her job. The process should also understand how an answer could affect how the individual conducts business—where he or she would likely need the information, in what format, when, and via what channel.

Company leaders interested in improving their decision making can use machine learning and other amplified intelligence approaches to generate new growth ideas for their organizations. Amplified intelligence is becoming critical for competitive success around the world, across industries. US-based Uber uses big data to match passengers with car services.[7] European grocer Tesco leverages big data to capture a disproportionate share of sales from new families and parents.[8] Effective scenarios should be designed to be deployed for high impact. That impact should inform scope, solutions, and iterative development, in which incremental solutions are tested in real-life scenarios.

The best outcomes will likely be from scenarios where technology or analytics were seen as infeasible or too difficult to take advantage of. New opportunities exist when companies expand information-based decisions beyond just the executive suite's purview into the field by giving managers, sales teams, service techs, case workers, and other frontline employees simple tools that harness exceptionally complex intelligence. And, ideally, computational intelligence will be refined and extended by collective intelligence, creating a feedback loop where people are also augmenting the advanced tools and models. Individual creativity and resourcefulness can and should continue to flourish. The goal, however, should be mutual elevation: As machine analytics are enhanced, users have the opportunity for more nuanced and valuable pursuits. As these pursuits become increasingly nuanced and valuable, they put important feedback into the system. The overall outcome: Artificial intelligence amplifies human intelligence to transform business intelligence.

Insurance Industry Perspective

Larry Manno

In the modern age of information, data is power, and it is being employed by companies across industries to build and expand competitive advantage. Many companies are leveraging advanced analytical techniques, machine learning, and predictive modeling to augment their employees' decision-making capabilities. Technology companies like Google, Apple Inc., Facebook, and Twitter are ahead of the pack in collecting and analyzing consumer information.[i] Insights into consumer behaviors make them a threat to companies across industries that want a share of the consumer's wallet.

Insurance has always been an information-intensive industry. Data is a natural resource, and actuaries have been building analytical models for decades. The insurance industry has a thriving need for consumer data, but is lagging behind other industries due to lack of investment in technology and people. With the emergence of smart devices and related apps, making careful and thoughtful investment in amplified intelligence—the practice of using computers to augment human thinking—is a potential driver for future growth.

Location-based intelligence emerges

In the modern world, location-based information is widely used to make decisions; for example, the decision to drive or walk to your destination or the decision to stop at a specific restaurant. Businesses are now using geographic information systems (GIS) and geospatial data to uncover insights that help to target customers to increase sales, optimize supply chains, and evaluate risks. Companies across the globe capture, store, analyze, and visualize location data to make informed decisions.

Location-based intelligence (LBI) is highly relevant for P&C insurers, whose business is inherently tied to location. Use of LBI can help P&C insurers assess and underwrite their risk, make informed decisions to reinsure, detect, and reduce fraudulent claims, and improve customer experience. Additionally, insurers are increasingly pushing location-based capabilities to their policyholders. For example, numerous insurers now enable tow trucks to be called based on the geolocation of policyholders involved in an accident.

As our world continues to evolve, LBI matters more for P&C insurers in visualizing their geospatial density. As natural disasters appear to become more frequent (100-year storms becoming 10-year storms)[ii], insurers need better ways to model and visualize risk. Insurers and their agents have the opportunity to be more proactive in how they leverage this data to support their policyholders. For example, a P&C agent could identify risky customers and proactively suggest additional coverage by seeing how densely populated an area is and comparing that with natural disaster predictive models.

Faster, smarter, and superior claim handling

Consider this common scenario in the underwriting and claims leadership war rooms: A seasonal storm rolls into an area where the insurer has large packets of insured property. This density brings the potential for higher losses—especially when compared with their competitors. How does the leadership team quickly gain an understanding of the impact and deploy the necessary resources to their affected policyholders? How does this intelligence improve the ability of the resources "on the ground" to serve their customers better?

An answer: GIS. By using GIS, the claims department can access the potential impact to the properties in that area and proactively call and/or send text alerts to the insured with specific information on how to protect the property from disaster. This will help the insurer connect with the customers in difficult times and possibly result in improved customer loyalty. If the property is affected by the storm, the insurer can overlay images of the damaged property with the path of the storm to access the damage and close claims much faster.

Such a customer experience would be achievable through LBI. GIS adds fuel to the nascent data visualization capabilities at many leading insurance companies. As insurers' ability to integrate various sources of data to uncover the quickest and most accurate picture on the ground improves, the more valuable the insurer-policyholder relationship can become.

Location-based data to model risk

Location-based data is a fundamental element in modeling risk. At the core of underwriting is the ability to assess and manage risk. Over the last decade, insurers have developed sophisticated mechanisms to assess risk. However, the use of GIS/geospatial data was not that prevalent in the industry. With GIS and geospatial data, insurers can assess risks by employing advanced modeling tools that overlay location-based data on models of buildings, roadways, and other physical features to visually analyze the risk.

Suppose a business owner wants to obtain a quote to insure its factory by providing key information about the property (address, layout, and pictures). In this example, the underwriter could cross-reference the property details with other location-based data, such as other factories or stores, past losses, and risks associated with disaster, and visualize them to make informed decisions.

When the data is analyzed within the context of location, the underwriter, risk inspector, and actuary will be able to make informed decisions about the risks and the coverages that are required.

The quantification of health and fitness data

Amplified intelligence has tangible applications to the P&C sector, but another emerging application of this capability is rapidly changing how we live our lives. Just as telematics has disrupted the auto insurance business, the concept of quantified self could be a potential disruptor for the life insurance industry. "Quantified self" refers to the use of wearable devices that monitor individual health and fitness metrics—who doesn't know someone who is wearing a Fitbit, Jawbone or a Nike Fuel band—and has opened up a new world of data for insurers to analyze.

The data captured from multiple health and fitness monitoring devices and apps can be integrated and turned into useful information highlighting a customer's behavior, health status, medical conditions, and overall well-being. Life insurance companies could subscribe to that data to improve risk assessments, underwriting decisions, and the cost of insurance including discounts in premiums based on increased or decreased health risk for the individual. They could also use quantified self information to cross-sell and up-sell offers, and make customer-retention decisions. In turn, insurers can serve as a "coach" to their policyholders, providing a proactive service focused on wellness and physical and mental health.

Applying sophisticated algorithms and machine learning techniques to the vast quantities of data generated by the quantified self movement can help to identify trends and correlations—enabling insurers to generate powerful insights about their customers' behavior and to provide incentives for more active lifestyles. It's mutually beneficial with customers paying less for coverage and insurance companies reducing their risk of having to pay out during major medical emergencies, like heart attacks and strokes. Technically, these advances require data, tools, and processes to perform core data management, modeling, and analysis functions.

Amplification of capabilities

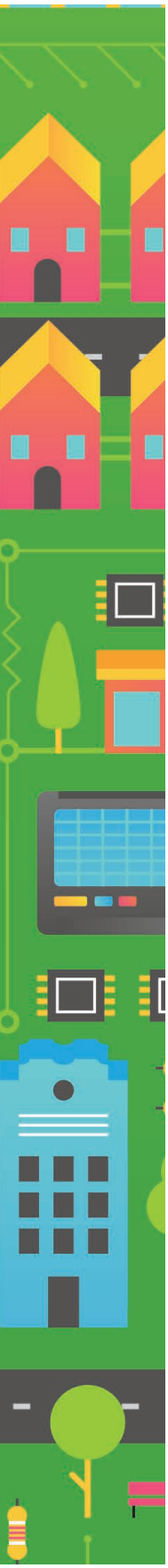
The world is in a constant state of change. Within insurance companies, compelling business cases now exist that call upon amplified intelligence techniques to solve complex business problems that were nearly impossible or impractical to address until recently.

The continued expansion of valuable data further emphasizes the need for having effective enterprise information management capabilities. Business-centric, siloed data stores require consolidation into integrated data repositories that can provide an enterprise view of their business. Data governance, analytical factories, and mastery of the business value of the data will soon become minimum requirements. In the end, amplified intelligence systems result from the coalescing of all these capabilities to enable insurers to make the right decision at the right time.

Footnotes

[i] Julia Angwin and Jennifer Valentino-DeVries, *The Wall Street Journal,* "Apple, Google Collect User Data", April 22, 2011, http://www.wsj.com/articles/SB10001424052748703983704576277101723453610, accessed May 12, 2015.

[ii] Paul B. Farrell, "Warning: 100-year climate disasters every 100 days", *MarketWatch*, September 25, 2013, http://www.marketwatch.com/story/warning-100-year-climate-disasters-every-100-days-2013-09-25, accessed May 12, 2015.



Lessons from the front lines

Moving science from the lab to the digital age

The University of Minnesota (UMN) has been driving innovation in health informatics for over 50 years. As its health informatics-related research efforts continued to grow in response to trends such as the rise of technology and the growing demand for higher-quality and lower-cost health care, UMN realized that it needed a centralized, enterprise-wide biomedical health informatics (BMI) platform to more effectively and efficiently support the growing data needs of UMN's researchers and its medical and health science partners.

UMN's goal was to establish informatics as a bridge to accelerate the application of discoveries in clinical practice and to transform the science of health care delivery for better population health. The BMI platform could help UMN meet this goal, in part, by connecting clinical and translational science researchers to clinical data and biological samples, and by supplying easy access to biomedical integrated informatics resources and tools to conduct their studies.

In 2010, UMN's Institute for Health Informatics, in conjunction with the UMN Clinical and Translation Science Institute, embarked on a multiyear effort to create a biomedical informatics platform, which is based on a suite of analytical and data warehousing solutions that combine clinical, financial, and research data to enable observational studies and predictive analytics. The new platform provides access to acute and ambulatory information on more than 2.1 million patients from the local health system electronic medical record. The platform also offers productivity tools, including straightforward interfaces to create queries of de-identified patient records, data capture tools to enter patient survey data, an integrated system to better manage clinical trials, and a secure social networking application for some 4,000 researchers across UMN and its partner facilities. In essence, the platform is intended to amplify the intelligence of each stakeholder by allowing them to work together through collaborative systems.

As awareness of the enterprise informatics platform grows, so does the number and level of sophistication of research requests. Researchers, non-clinical users, and IT staff understand data from a much broader perspective, which helps advance UMN's research agenda and its ability to improve health care by partnering with other health systems and universities.

Visions of the future

Leveraging smart glass hardware, analytics, and back-office tools, a global oil and gas company created a pilot platform for amplifying the effectiveness of rig workers. The goal of this effort was to deliver hands-free job aids, decision support, and workflow automation to individuals working in remote locations.

The platform works as follows: When field equipment malfunctions on an oil rig, sensors detect the issue and proactively notify a nearby field service agent via smart glass. Analytics then delivers critical diagnostic information on the issue. This information, augmented by powerful analytics capabilities applied to sensor and other relevant back-office data, includes step-by-step instructions for repair.

Using a laptop or a cumbersome paper manual to triage and troubleshoot

malfunctioning equipment might require service agents to remove their gloves and step away as they look for answers. However, smart glass makes it possible for them to view needed information in real time and on the spot—thus enhancing worker efficiency, accuracy, and safety. Moreover, with a simple wave of the hand, the agent utilizes a gesture control armband to initiate a video conference with level-three support back at the home office. The remote expert can see what the agent sees, talk to him or her through the procedure, and even provide annotated instructions that appear on the agent's augmented display.

The agent can also send data to a central database. With a head nod or tilt, he or she can maintain a log or "checklist" of completed activities and create new notations via voice as the repair is being made. That repair log then becomes available to the next technician who services the field equipment. Critical information isn't lost in stacks of paperwork; it becomes digitally organized and accessible to those who need it.

Use cases for platforms like this are not limited to oil and gas field workers. At distribution centers, for example, drivers often conduct vehicle inspections prior to turning the ignition. In many instances, drivers must look for vehicle- and manifest-specific details—details that would be almost impossible to memorize without years of training. Virtual instructions accessed via smart glass can guide drivers through inspections, accelerating the entire process and increasing its accuracy and effectiveness.

The combined power of smart glass technology, analytics, and back-office systems (knowledge databases or warehouse management systems) can help organizations in almost any industry or sector realize the vision of an amplified workforce by offering information whenever, wherever.

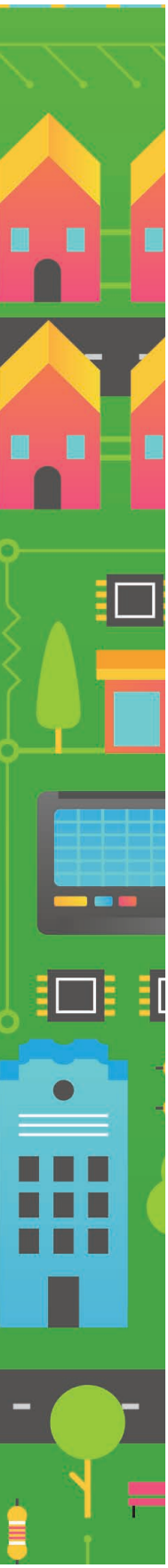
Solving crime in real time

In 2010, the data systems in the Los Angeles Police Department (LAPD) did not augment the intelligence of its nearly 10,000-strong force.[9] Data were trapped in organizational silos, forcing members of the department to navigate multiple systems with limited means to quickly integrate and analyze the information available to them. Leads could easily become cold.

Crime analysts, for example, used a mainframe system to retrieve field interview data and another system for Department of Motor Vehicles information. A separate team was responsible for data in the automated license plate recognition system—LAPD patrol cars are outfitted with scanners that snap pictures of cars and their license plates as they drive by—and it could take several days for detectives to get the results of a search. The department couldn't aggregate 911 or police radio calls to create a real-time picture of crime. Reports had to be printed and physically delivered.[10]

To tackle these issues and augment the capabilities of its force, the LAPD launched an analytics and visualization effort to integrate and analyze data from multiple local, state, and federal sources. The initiative has added meaningful capability across the board to the LAPD's analysts, officers, detectives, and command staff—delivering insights tailored for their needs on crime scenes, during traffic stops, or at the station.

In one example, robbery victims could only remember part of the perpetrators' license plate number and that the car was a grey Cadillac—not much to go on in a city with



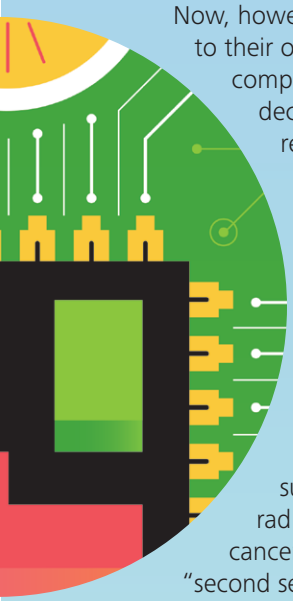
millions of vehicles. Using the new system, crime analysts narrowed down the number of possible cars, and the victims were able to identify the vehicle whose picture was in the automated license plate recognition system. Two days later, detectives spotted the car and followed it to what turned out to be another robbery attempt. The suspects were arrested on the spot.[11] Because of amplified intelligence in the field, the lead didn't have a chance to get cold.

Successes such as these are fueling the growth of advanced analytics to fortify the effectiveness of the LAPD. The department is in the process of rolling out analytics across the organization and supporting the effort with rigorous training and ongoing support. Although the endeavor is not without its challenges and costs, it is helping the LAPD meet its mission to safeguard the lives and property of the city's residents and visitors.[12]

My take

Thomas H. Davenport
President's Distinguished Professor at Babson College
Visiting professor at Harvard Business School
Independent senior advisor to Deloitte Analytics

There is little doubt that computers have taken substantial work away from lower- and middle-skilled jobs. Bank tellers, airline reservations clerks, and assembly line workers can all testify to this effect. Thus far, however, high-end knowledge workers have been relatively safe from job encroachment. Computers have certainly changed knowledge work, but they have largely augmented human labor rather than replacing it.



Now, however, knowledge workers face a challenge to their own employment. Analytical and "cognitive computing" technologies can make almost any decision with a high degree of accuracy and reliability. From *Jeopardy!* questions to cancer diagnosis to credit risk decisions, there seems to be no decision domain that smart machines can't conquer.

Thus far, it's been rare for a manager, professional, or highly specialized worker to lose a job for this reason. The decisions automated have been relatively narrow, and only small parts of knowledge workers' roles have been supplanted. For example, while automated radiological image analysis can identify certain cancers, at most their use has been to supply a "second set of eyes" for a radiologist's diagnosis.

However, if my children were planning to become lawyers, doctors, accountants, journalists, teachers, or any of the many other fields for which automated or semi-automated offerings have already been developed, I would have some advice for them (which I am sure they would ignore!). I would advise the following actions:

- Closely monitor automation developments in their chosen field, and monitor which aspects of the profession are most likely to be automated. For example, I suspect that in journalism—already a difficult field because of the decline of print—the most likely candidates are those involving high levels of numerical reporting, such as sports and business journalism. Reporting on elections and political surveys might also be at risk. More investigative and human interest reporting is relatively safe, I suspect.

- Become an expert in their chosen field as quickly as possible. Entry-level jobs are most at risk from automation, but experts are usually still needed to handle the most difficult cases and to advise and develop new rules and algorithms.

- Develop an understanding of the technologies that are most likely to become important in the industry. For highly quantitative fields, machine learning is a strong candidate; for more textually oriented fields, Watson-like cognitive computing is more likely to be the automating technology.

- Most of all, I'd advise workers in fields where automation is coming to "make friends with their computers." Learn how they work, what they are good at, and their areas of weakness. If possible, learn how to modify and improve them. Understand the implicit assumptions that underlie their models and rules, and under what conditions these assumptions might become invalid.

In the short run, knowledge workers are probably safe from substantial automation, but taking these steps will likely make for a more successful career. In the long run, all bets are off!

Cyber implications

CYBER security and data privacy considerations should be a part of analytics conversations, especially as amplified intelligence moves insights more directly into the heart of how, and where, business occurs. Information should be monitored and protected when it is at rest, in flight, and in use. These three scenarios feature different actors using different platforms and that require different cyber security techniques. Moreover, for each scenario, you must know how to manage misuse, respond to breaches, and circle back with better security and vigilance.

"At rest" is the traditional view of information security: How does one protect assets from being compromised or stolen? Firewalls, antivirus software, intrusion detection, and intrusion prevention systems are still needed, but are increasingly less effective as attackers rapidly evolve their tools and move from "smash and grab" ploys to long-dwell cybercrimes. Instead of an outright offense that may leave telltale signs, attackers gain access and lie dormant—launching incremental, almost imperceptible activities to discover vulnerabilities and gain access to valuable IP.

The additional emphasis on "in flight" and "in use" reflects a shift in how organizations put their underlying data to use. Information is increasingly consumed in the field via mobile, potentially on personally owned consumer devices. Encryption can help with transmission and data retention. Identity, access, and entitlement management can help properly control user actions, especially when coupled with two-factor authentication. Application, data, and/or device-level containers can protect against attacks on the network, hardware, or other resident apps. Again, though, these demonstrated techniques may not be enough, given the growing sophistication of criminal products, services, and markets.

Organizations should couple traditional techniques with advanced analytics, amplifying the intelligence of cyber security personnel. Leading cyber initiatives balance reactionary methods with advanced techniques to identify the coming threat and proactively respond. They take a fusion of information from a range of sources with differing conceptual and contextual scope, and combine it with human-centered signals such as locations, identity, and social interactions of groups and individuals. This approach has a number of implications. First, it creates the need to adopt a broader cyber intelligence mindset—one that leverages intel from both internal and external sources. Insight pulled from new signals of potentially hostile activities in the network can point to areas where security professionals should focus. Similar to how amplified intelligence informs approaches to business operations, this raw security data should be analyzed and presented in ways to augment an individual's ability to take action.

Machine learning and predictive analytics can take cyber security a step farther. If normal "at rest," "in flight," and "in use" behavior can be baselined, advanced analytics can be applied to detect deviations from the norm. With training to define sensitivities and thresholds, security teams' capabilities can be amplified with real-time visibility into potential risks when or before they occur. At first, this ability is likely to simply guide manual investigation and response, but eventually it could move to prescriptive handling—potentially enabling security systems to automatically respond to threat intelligence and take action to predict and prevent or promptly detect, isolate, and contain an event when it occurs.

Where do you start?

THE information agenda is not without baggage. But hopefully that baggage includes the foundations needed for strides in amplified intelligence. One size likely won't fit all. Organizations will probably need a variety of approaches, tools, and techniques suitable to the question asked and the end users affected. They should also accommodate each scenario's requirements around data velocity, structure, analytics complexity, and user interface/deployment vehicles. While individual mileage will vary, some overarching steps can help guide the journey.

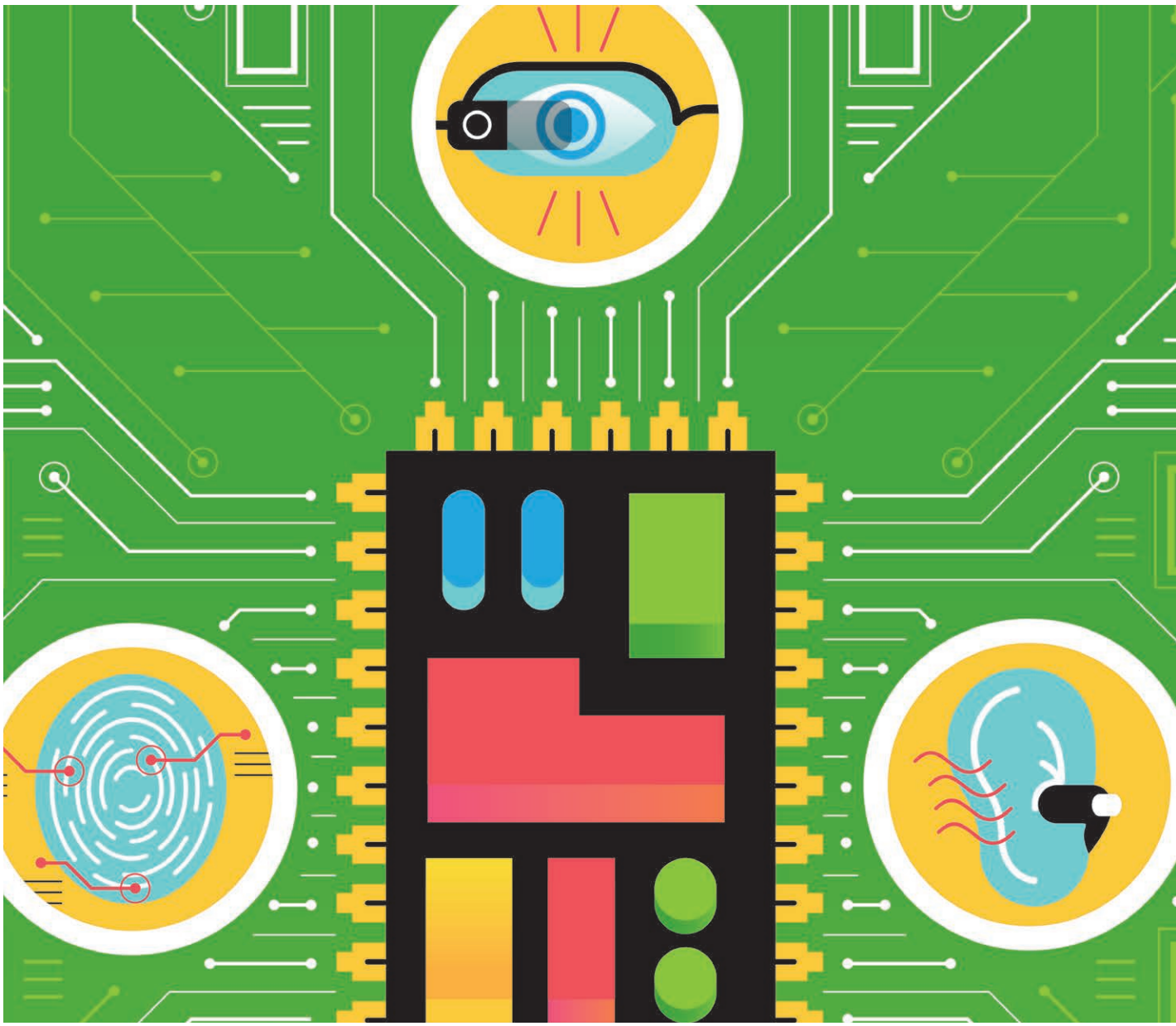
- **Set priorities by asking business questions.** Organizations can start by asking business leaders for the wish list of questions they would love to be able to answer—about their customers, products, processes, people, markets, facilities, or financials. Develop the wish list independent of constraints on what is knowable, answerable, or technically feasible. Use the questions to guide priorities and reveal what types of data might be needed—internal and external, structured and unstructured, information already captured versus information not currently measured or stored. Identify what problem-solving techniques may be required: in-memory or massively parallel processing for analyzing huge data volumes, deterministic or probabilistic modeling for advanced statistical modeling, visualization or querying environments for exploration and discovery, or predictive analytics and/or machine learning to automate the formulation of hypotheses.

- **Check your gut.** One of the only things worse than an unanswered question is investing in insights your organization is not prepared to act on. Ask the hard qualifying question up front: If we are able to answer the high-priority questions, does the organization have the institutional fortitude required to drive systematic changes? Long-standing assumptions may be challenged and require a different approach to markets, incentives, or behaviors. High potential is one thing, but the focus of early efforts should balance the opportunity against expected organizational resistance. It will likely take time to become a data-driven culture.

- **Design from the user down.** Amplified intelligence is about putting advanced analytics in the hands of the individual when he or she needs it. User experience should dictate the format, granularity, and decisiveness of how that insight should be provided:
  - *Format*—the channel, notification, and interaction method
  - *Granularity*—how much detail is needed and in what context
  - *Decisiveness*—whether responses are descriptive, predictive, or prescriptive, which can range from providing passive supporting detail to aid decision making to proactively recommending a response or taking action

- **Expect resistance (which is not futile).** A recent Gartner report found that "by 2020, the majority of knowledge worker career paths will be disrupted by smart machines in both positive and negative ways."[13] Investors are aggressively directing capital toward AI and robotics, and venture capital investments in AI have increased by more than 70 percent per year since 2011.[14]

Unions and labor groups could impede adoption. Unskilled labor categories may see greater impact, as robotics and machine learning continue to disrupt lines of employment. Transparency of intent will be important, along with programs to help retool and redeploy displaced workers. Prioritizing investments that live up to the full potential of amplified intelligence means using the technology to enhance the value of the end worker. In a way, amplified intelligence initiatives are a direct investment in the individual that makes them even more valuable to the organization.



Bottom line

IT'S easy to get stuck on the "what?" of analytics—trying to define conceptual models for the enterprise's wide range of information concerns. Leading companies, however, have aggressively pursued the "so what?"—prioritizing crunchy questions with measurable value as the focal points of their endeavors. Amplified intelligence represents the "now what?" of moving from theoretical exercises to deploying solutions where business decisions are actually made. Usability and outcomes should take their rightful place over platforms, tools, and data—important ingredients, to be sure, but only part of the recipe. While the machine continues to rise to impressive new heights, its immediate potential comes from putting it in the right hands, in the right manner, when it counts.

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