

THE Actuary

VOLUME 16 ISSUE 2

APR
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MAY

**YOU CAN
LEARN A LOT
BY LISTENING**

**Thinking
deeper**

**The power of
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Expanding Opportunities, Mining Actuaries' Skills

More than 30 years ago, I took on a nontraditional actuarial role when my wife and I formed and capitalized a long-term care (LTC) reinsurance company. LTC was a relatively new product line at the time, so investing all of our accumulated savings could only be described as “risk is opportunity.”

The Society of Actuaries (SOA) works to find new ways to support membership in expanding their skills and advancing our future as a profession. I have frequently mentioned one of my biggest priorities, which is to expand employment opportunities. This concept is a key part of the SOA Board's long-term strategy. The SOA Board's Cultivate Opportunities Team (COT) has been working to identify ways the SOA can:

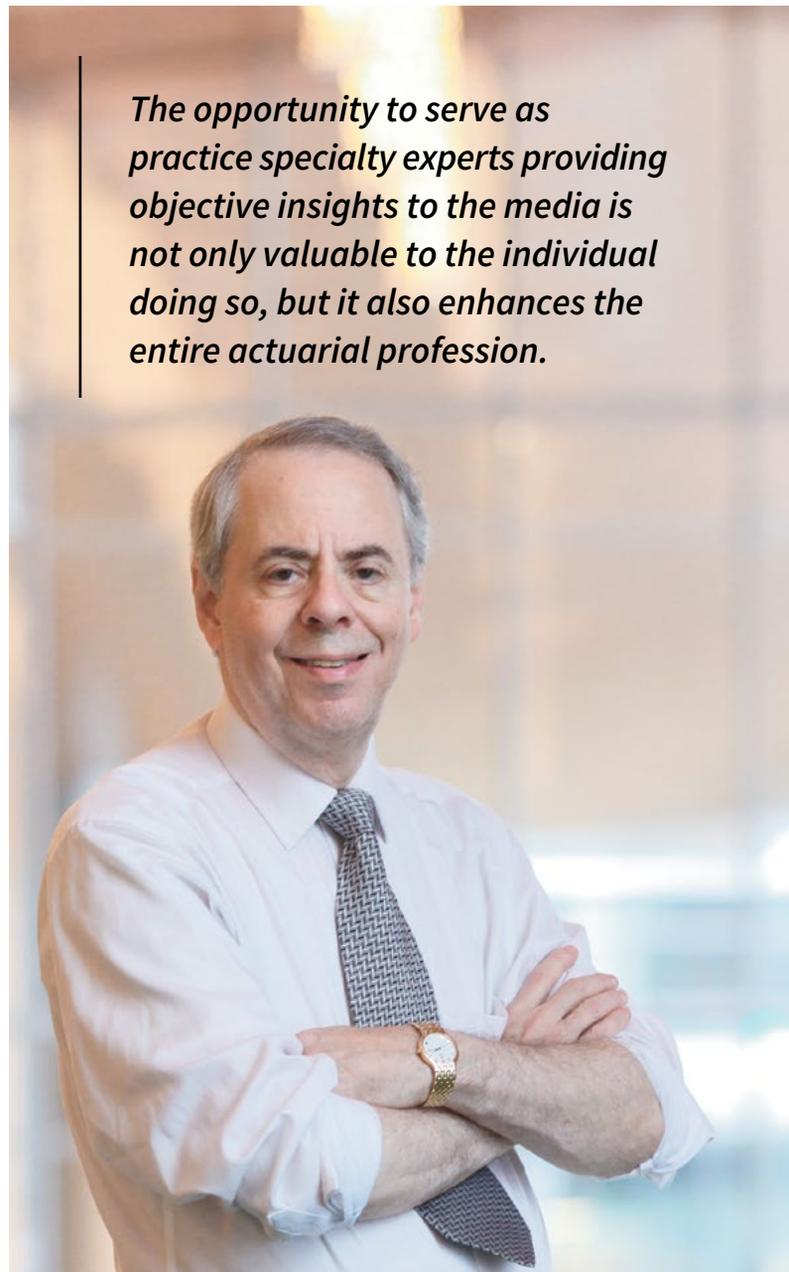
- » Enhance actuaries' business skills to increase C-suite job opportunities.
- » Promote the value of actuarial skills for jobs in nontraditional industries.
- » Provide the tools for actuaries to be prepared to take on these new roles.

In my letter in the February/March 2019 issue of *The Actuary*, I discussed the indispensable value of communications skills in achieving success in these

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PHOTO: HYON SMITH

The opportunity to serve as practice specialty experts providing objective insights to the media is not only valuable to the individual doing so, but it also enhances the entire actuarial profession.



nontraditional roles, especially in creating new leadership opportunities in the C-suite.

For actuaries who have developed their communication skills, the opportunity to serve as practice specialty experts providing objective insights to the media is not only valuable to the individual doing so, but it also enhances the entire actuarial profession. Having actuaries serve as media experts also brings value to society and prestige to our profession, as our objective analyses can be very helpful to those who craft our public policy.

The SOA, through its media and research departments, continues to seek ways to highlight these actuarial skill sets, such as in recent news articles involving mortality trends, the opportunities to reduce health care costs, development of solutions to impending societal crises in our aging population (especially around the increasing need for LTC services), measuring climate change and much more. Many of these highlight SOA research projects that utilize predictive analytics capabilities and tools.

The effort to expand opportunities for actuaries can be seen on the online SOA Job Center, where predictive analytics and nontraditional job postings are available. The relatively new SOA Predictive Analytics Certificate program is another example of keeping actuaries at the forefront of evolving methods. This intensive training program utilizes both online and in-person program modules, together with self-study coursework and a final graded project assessment. We continue to develop numerous other professional development opportunities, including the seminar in advanced business analytics, the health analytics seminar and a Python boot camp. One new initiative for this year is to search for more and better ways to deliver professional development aimed at expanding actuarial skill sets in a way that increases its utilization and value to all our members.

Through our marketing and communication campaigns, we help promote the work of actuaries, especially in predictive modeling and analytics. Recent case studies on SOA.org/predictive share experiences from members who currently utilize predictive analytics in both life and health insurance. We highlight members who have achieved success in nontraditional roles in information technology (IT), human resources, marketing and other areas. The SOA podcast series “Listen at Your Own Risk” features developing fields such as InsurTech,

blockchain, autonomous vehicles and artificial intelligence (AI).

The SOA also has sponsored Kaggle program awards that showcase innovative solutions to a variety of business applications and industries. Past Kaggle challenges have included how to prevent shipping incidents at sea through satellite imaging and how to harness machine learning for credit default risks in the financial sector, just to name a couple.

This spring, the SOA hosts the inaugural InsurTech LTC Conference, where actuaries and nonactuaries alike will gather to learn about cutting-edge developments that could impact the effectiveness of LTC insurance. I am pleased the SOA is developing these new types of events, helping actuaries gain new skills and be at the forefront of emerging topics such as InsurTech. Later this year, the SOA will launch its Actuarial Innovation and Technology Strategic Research Program.

The SOA continues to look for ways to enhance employers’ awareness of the skills actuaries can bring to both new and existing technologies. I encourage you to learn more about these opportunities as well as to share your success stories—how you have utilized your actuarial skills in nontraditional ways and job markets—with us. ■

RELATED LINKS

2017–2021 Strategic Plan

SOA.org/strategic-planning

Kaggle Involvement Program

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Actuaries and Predictive Analytics

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Listen at Your Own Risk

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Welcome to Media Psychology!

BY DOROTHY L. ANDREWS

As actuaries, we need to think beyond Excel, Python and R code and focus on the behaviors being mediated through emerging technologies.

YOU ARE PROBABLY WONDERING WHAT MEDIA PSYCHOLOGY IS

and what it has to do with actuarial work—and rightly so. This issue of *The Actuary* explores how principles of media psychology are critical to analyzing data in a future mediated by technology, especially those black mirror devices many of us can't seem to live without. Proceed through the pages of this issue, rich with psychological theory, as a scientist, contemplating innovative methods to measure the behavioral constructs discussed by the psychologists featured in this issue.

The psychologists are following in the footsteps of John Watson, who is unquestionably regarded as the father of behavioral psychology, and Marshall McLuhan, who is undeniably the father of media analysis.

The intersection of these two fields provides the foundation for media psychology. Watson shifted the study of psychology from the study of the mind to the study of behavior, observable and measurable through experimentation. McLuhan became obsessed with understanding the importance and power of media on behavior. At the

apex of his influence, the word “media” for most meant radio, television and the written word, and McLuhan examined the impact of these media from two perspectives. The first was the perspective of its impact as a new form of media, and the second was the perspective of its impact on the human experience through its use. McLuhan felt the creation of new media was far more important than the ways in which it was deployed.

McLuhan authored the seminal work *The Medium is the Message*. It distinguishes the importance of technology from the

content it mediates. This sharp contrast in practical terms means the telegraph was more important as an invention than the messages it was used to transmit, the television more important than the broadcasts, the internet more important than any one website. Now enter virtual, augmented, mixed and hyper reality, which McLuhan might deem more important than the sensations created by each form. In *Understanding Media*,¹ McLuhan writes: “The message of any medium or technology is the change of scale or pace or pattern that it introduces into human affairs. The railway did not introduce movement or transportation or wheel or road into human society, but it accelerated and enlarged the scale of previous human functions, creating totally new kinds of cities and new kinds of work and leisure.”

We find ourselves in times as revolutionary as those introduced by the railway system. The factorial growth in the use of new media to transact our daily lives is accelerating our disconnectedness from human interactions, requiring a new kind of psychology to enhance and monitor the deployment of this new media and to understand how human behavior is massaged by it. Black mirror devices

are capable of navigating through and transmitting petabytes of data to inform decision-making for users at both ends of the connection. We’ve come a long way since two Campbell soup cans and a piece of string. (I must be careful here because millennials might not get the reference, but they have Google, so I’ll continue.) Our explosive use of media to navigate our lives and our visions for its future use have not been unaccompanied by fear. Fear is a normal response to innovation, and history supports this. According to Brett King, since the industrial age, technology disruptions have obsoleted many labor-intensive processes, incited worker protests and altered employment patterns.² The internet has had no less of an effect on the human response to its innovation. A study conducted by McKinsey & Company in 2011 estimated the internet created 2.6 jobs for each lost to technology-related efficiencies.³ Immersive technologies and artificial intelligence (AI) are the new internet, introducing new fears that will need to be overcome to maximize their benefits to the human experience.

Media psychology is critical to understanding these concerns as immersive technologies become more advanced

and available for integration with our lives. Some will fight this integration for themselves, their loved ones and society, reminiscent of the early Luddites who smashed steam engines to prevent their dominance in the textile industry of the early 1800s. Modern-day Luddites will fail in their quest to derail immersive technology integration and, instead, find membership among a minority who don’t use the internet. The Pew Research Center estimates this number at 11 percent for reasons correlated with age, educational attainment, household income and community type.⁴ Many of these disconnected few require a special kind of psychology for integration, because we are not going backward to appease their need for “old-school” conventions. The old ways are out, and more new ways are coming.

As actuaries, we need to think beyond Excel, Python and R code and focus on the behaviors being mediated through emerging technologies. The information highway is no longer a highway—it is a hyperspace, with topological properties that advanced technologies will need to thrive on data as its life blood, and where data privacy must become a nonissue. Watson and McLuhan left a strong intersection of research to

study this data holistically, rather than in fragments, to improve insured risk profile development in real-time. Please enjoy this issue. ■

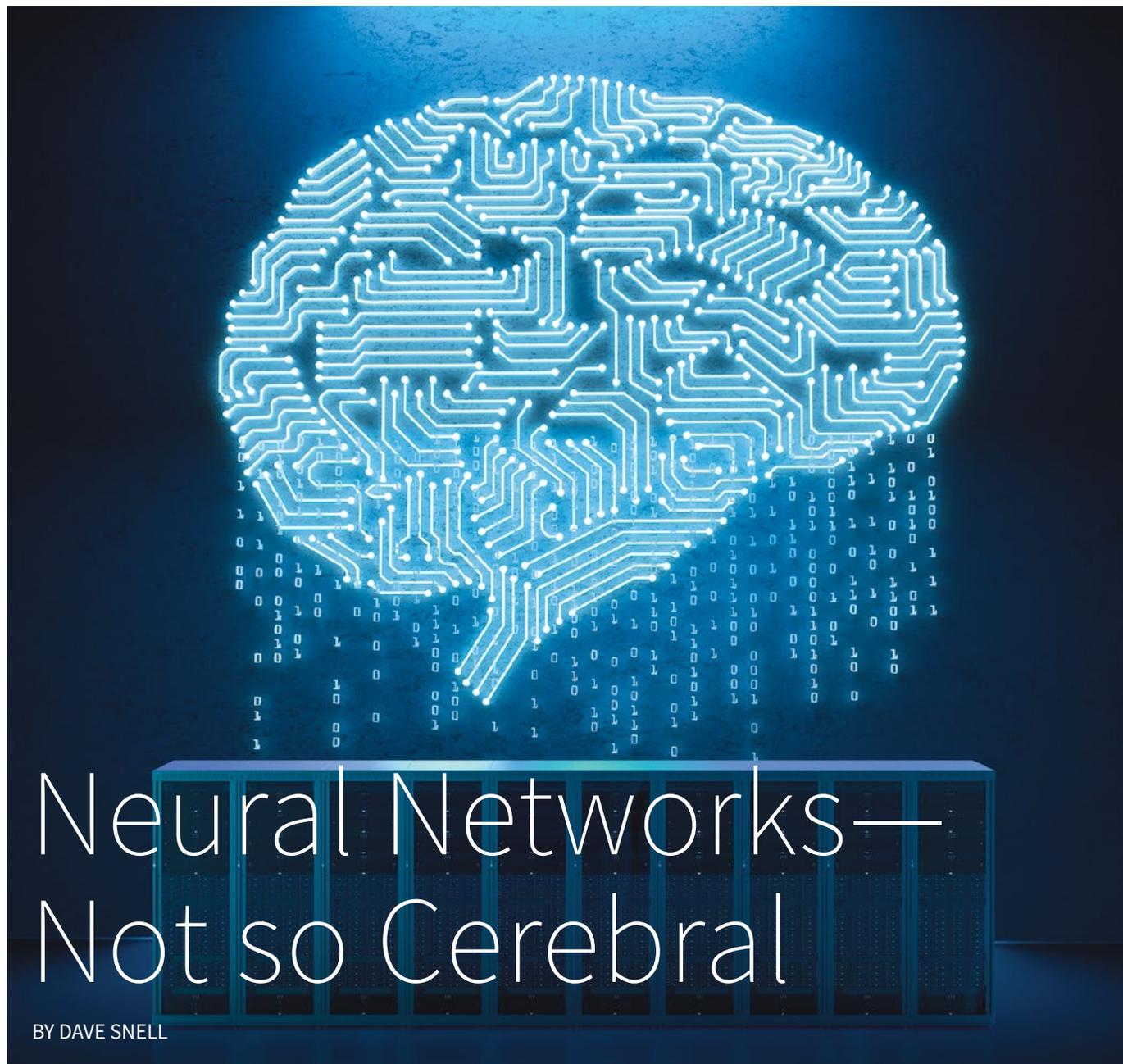
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- ³ Pélissié du Rausas, Matthieu, James Manyika, Eric Hazan, Jacques Bughin, Michael Chui, and Rémi Said. Internet Matters: The Net’s Sweeping Impact on Growth, Jobs and Prosperity. *McKinsey & Company*, May 2011, <https://www.mckinsey.com/industries/high-tech/our-insights/internet-matters> (accessed February 27, 2019).
- ⁴ Anderson, Monica, Andrew Perrin, and Jingjing Jiang. 11% of Americans Don’t Use the Internet. Who Are They? *Pew Research Center*, March 5, 2018, <http://www.pewresearch.org/fact-tank/2018/03/05/some-americans-dont-use-the-internet-who-are-they/> (accessed February 27, 2019).



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Neural Networks— Not so Cerebral

BY DAVE SNELL

LAST WEEK, I NEEDED TO ADD A POWER SWITCH IN A WALL OF OUR HOME, so I pulled out my electric edge saw to make the precise rectangular cut in the sheetrock. I also utilized my fiber-optic endoscope to see a color display of the exact placement of every wire, water pipe and gas line inside—wirelessly displayed on my iPad. Twenty years ago, I did not have any of these tools. Now I find them indispensable.

Likewise, when approaching a difficult predictive modeling problem, I find my genetic algorithms, sentiment analysis and neural network tools to be essential

components of my actuarial toolkit. Yet, when I started as an actuary, that toolkit contained only commutation functions, linear regression techniques, and various graduation and curve fitting tools that seem primitive by today's standards. And in my prior career as an engineer, I used a slide rule for my calculations. When we cover generalized linear models (GLMs) in the graduate-level artificial intelligence (AI) machine learning course I teach, I bring the slide rule and pass it around so the students can play with this ancestor to GLM software. Some students find this relic from the predawn of history quite fascinating.

Commutation functions go back at least to the 1800s. My 1895 edition of the *Encyclopedia Britannica* has several pages describing them. It also shows extensive techniques for interpolation, graduation, curve fitting and even generalized linear modeling techniques (before they were given that name in 1972). In 2018, I wrote an article stating that commutation functions were obsolete, and a senior staff actuary at the Society of Actuaries (SOA) corrected me. He pointed out that they are still in use on some defined benefit pension plans.

Sadly, many actuaries have chosen not to embrace the new AI and predictive analytics tools. They tend to be the same actuaries lamenting the incursion of data scientists, CPAs, MBAs, CFAs and other professionals into financial risk positions formerly held only by actuaries.

How did we let this happen? In fairness, some of the new techniques come with the baggage of intimidating names. Take genetic algorithms, for instance. Five years ago, I had the honor of speaking at the Human Genome Institute at Washington University's medical school. My topic was genetic algorithms and, frankly, I went into the lecture hall terrified that within five minutes I would be thrown out as a fraud—because I am! These were geneticists, and even after several certificate courses at the university's MiniMed School (13 semesters so far), I know very little about genetics. It is a vast and complex subject. But genetic algorithms were merely inspired by genetics. Genetic algorithms are easy, yet powerful, ways to solve problems involving lots of variables and no known closed solution. After two and a half hours, we had to give up the lecture hall because it was needed by another group. I left feeling pleased that geneticists were so eager to learn about genetic algorithms from an actuary!

Even more intimidating than genetic algorithms is the term neural network. Neural network: What image does this data science term conjure up for you? For many, it conveys an image of the emulation of a human brain. That's unfortunate as I see it. Biological neurons are only an inspiration for a data science technique we use to form predictive models. The artificial neural network (ANN) is far more simplistic than a biological one. However, the "artificial" qualifier is usually dropped for convenience, and we use the term neural network (NN)—a term many people find somewhat intimidating. But NNs are simple.

Most actuaries are familiar with the term linear model. It assumes the dependent variable y is some linear combination of the independent variables: $y = f(X_1, X_2, \dots, X_n)$. We write this as $y = \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n$, where the various β_i s are constants. This is a useful prediction technique, but it has limitations. It can work well for Gaussian

distributions, but it gives disappointing results for other distributions, such as Poisson. An approach not limited by this distribution assumption is the GLM. GLMs employ a link function. We say that $y = f(g(X_1, X_2, X_3, \dots, X_n))$.

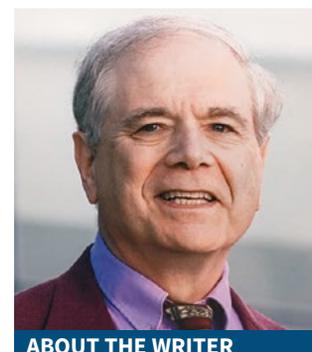
Essentially our NN modeling technique is a set of layers of GLMs. Between every layer and the next layer, we take the sum of a set (vector) of weights times the input vector (a simple dot product), then apply an activation function (a link function) to get our output prediction. Is a NN more difficult to trace backward, to show all the breadcrumbs leading from your input vector to your output prediction? Sure, it is, because each layer is like a GLM and we are cascading several layers.

The path backward becomes tedious, but that doesn't make it cerebral, or even magical. It is just a straightforward, albeit many-layered, way to build a model that often provides a superior prediction for classification or regression situations. We train the NN by assuming a set of weights (coefficients) for each layer and then refining them by iteratively comparing the output for a given input, with desired outputs for that input, and applying simple calculus to calculate progressively better weights. The process is very similar to what we do for GLMs.

Initially, NNs were thought to be of potentially great value for solving numerical regression and classification problems. But problems involving nonnumeric data, such as images, were considered beyond the scope of a NN. Enter the convolutional neural network (CNN). It turns out pictures can be digitized, and that provides the opportunity to feed the digital representations to deep NNs (with many layers) for image recognition. They can even go beyond the recognition of images and create new ones. A generative adversarial network (GAN) can create a painting in a specified genre to convince an expert it is by a specific famous artist.

NNs can solve numeric problems, perform image recognition and even generate creative images. Yet, they are all simple in concept. In effect, they are not cerebral at all!

What's in your toolkit? ■



ABOUT THE WRITER

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Health Section Update

In the past 12 months, the Society of Actuaries (SOA) Health Section has achieved incredible things. The highlight was launching Initiative 18111, a joint initiative with the Kaiser Family Foundation, where industry leaders have come together to address some of the issues facing rising health care costs in the United States. Health care costs are now 18 percent of gross domestic product (GDP) in the United States, versus 11 percent in the rest of the developed world—hence the name 18111. In 2018, a summit was held at the Kaiser facilities in Washington, D.C. While this was a great day of respectful and challenging discussion, the real impact comes from taking action on our learnings and keeping the conversations going. As you can imagine, the continuation of Initiative 18111 will be a large focus for the SOA Health Section into 2019.

Another objective of the Health Section for 2019 is to evolve how we meet the needs of our members. We are focused on leveraging social media—primarily LinkedIn—to share industry news in a timely manner and to build community. This page is open to both Health Section members and nonmembers, so please join the conversation.

In addition to advancing Initiative 18111 and our LinkedIn page, the Health Section will continue to provide continuing education through high-quality webcasts, podcasts, meeting sessions and our flagship newsletter, *Health Watch*, which is now available in a new digital format.

The Health Section is well positioned to have another amazing year, and I hope you will join us!

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RELATED LINKS

Initiative 18|11

SOA.org/initiative1811

Health Section LinkedIn Page

bit.ly/SOAhealthLI



Speaking of Health

Join the SOA in Phoenix, June 24–26, for the 2019 Health Meeting—the SOA’s premier event for actuaries working in the health industry.

Keynote speakers Dr. Joel Selanikio and Austin Eubanks will kick off the event with insightful experiences and information.

Dr. Selanikio, co-founder and CEO of Magpi, is a physician at Georgetown University. He leads Magpi’s efforts to develop and promote new technologies and business models for health and international development, including mobile data collection and messaging software.

Eubanks, chief operations officer for Foundry Treatment Center, is an expert in the addiction treatment industry and a nationally recognized speaker and media contributor on topics surrounding behavioral health and addiction recovery.

Attendees can expect engaging educational sessions to gather valuable insight on the hottest issues facing health care today. Learn more and register at SOA.org/2019Health.

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BY KAREN E. DILL-SHACKLEFORD

Social Media Relationship Status: It's Complicated

Personality and habits can influence whether social media is good or bad for an individual

B

eing a media psychologist, something I notice is the tendency to jump to conclusions about social media use. Some see social media use as a mostly positive endeavor—a boon to one's social life and a pleasant way to spend free time. Others see it as much more negative—proof that relationships as we know them are disappearing along with our social skills.

A more accurate view of the role of social media in our lives is a bit more complex. If someone asks you whether social media will bring us to tears or to glory, tell them it depends on your personality and how you use social media.

The Selfie Paradox

Take, for example, a phenomenon known as the selfie paradox,¹ or the research finding that sharing self-portraits on social media is a common habit that offers both opportunity and risk. The paradox about selfies is that, although they are so common, people malign them more often than they praise them. There is a tendency to want to present yourself in the best possible light, but also not to seem narcissistic. When surveyed,² research participants said they believed the negative characteristics associated with selfies more than the positive ones. Negative characteristics include creating a false sense of everyday life by posting only the most positive images of yourself, while positive aspects include the quest for relatedness.

In light of the contradictions of selfies in pop culture, my colleagues and I³ designed a study to shed some light on the specific patterns of behavior associated with sharing various types of selfies on social media. We studied young women because they are a group who post a lot of selfies and are vulnerable to objectification and its consequences, which include physical and psychological issues.

In our research, we asked these young women to report on their selfie habits and the feelings they experience while viewing their own and others' selfies. We also measured three different types of personality factors we thought were relevant: narcissism, self-efficacy and a specific type of self-worth that is related to one's looks.

Different Personalities and Selfie Posts

Narcissism or Healthy Self-esteem?

Let's back up a bit and talk about what each of these personality types indicate. We were not measuring clinical narcissism, but rather nonclinical narcissism. Clinical narcissism is a serious psychological disorder. People who score higher on nonclinical narcissism might be called more self-focused or entitled rather than grandiose. Joe Pierre notes it's sometimes hard to tell the difference between healthy self-esteem and real narcissism, but the former is adaptive and the latter is dysfunctional.⁴

Self-efficacy: Yes, You Can

We also measured self-efficacy. Self-efficacy is a sense of personal agency. In other words, someone who is high in self-efficacy believes they have a reasonable amount of control over the problems they confront in everyday life. If a problem arises, this person believes they are able to do something to make a difference in the situation.

Your Looks Are Your Greatest Asset (Literally)

Finally, because we were interested in self-images of young women, we wondered how much they thought their self-worth was based on their looks. This is a problem that can hamper the health of this population. Some people believe they are only worthwhile if they are considered good looking by their peers. Some people realize their value lies in other things besides just what's on the outside. Even for good-looking people (or people who think they are good looking), the problem is that, like your mama told you, looks don't necessarily last. Therefore, you're building your house on the sand.

Psychologists Love Surveys

We measured each of these three personality factors via surveys. For example, for self-efficacy we asked participants to rate how much they agreed with statements such as: "I can always manage to solve difficult problems if I try hard enough."⁵ To measure nonclinical narcissism, participants rated how much they agreed with statements like, "I love showing all the things I can do."⁶ Finally, we measured how women's looks factored into their sense of self-worth with items like, "My sense of self-worth suffers whenever I think I don't look good."⁷

Different Predictions for Different Types of Selfie Styles

Our participants were roughly 200 women between 18 and 24 years of age. Almost all (88 percent) took selfies on a daily basis

and, on average, posted 3.3 selfies per day, with 73 percent posting the photos on Facebook. The most common type of selfies were photos taken at special events (33 percent) followed by beauty shots that concentrate on hair, makeup or outfit that show you looking your best (31 percent) and photos in which you are hanging out with friends (29 percent).

Because of our interest in how posting various types of selfies might be related to different feelings and personalities, we categorized the types of selfies young women posted as either focused on their looks or not. We called these two categories appearance-focused (for example, beauty or sexy selfies) and non-appearance-focused (for example, event or friend-related selfies). We also categorized the feelings the young women reported having while looking at selfies as either gratifying or insecure.

Our results paint an interesting picture of the relationships among young women's personalities, their thoughts and feelings about selfies, and their social media habits.

Personalities Predict the Types of Selfies Posted (and Vice Versa)

We learned that young women who were in the habit of posting selfies that weren't focused on appearance had higher self-efficacy than those who habitually focused on appearance. Think about this finding for a moment in terms of casting selfies as a negative or positive habit, because these findings tell a more complex story. All selfies are not the same. We may think of the stereotypical selfie posted by young women as scantily clad, or with a "duck face" or pouty pose. That's part of the picture. But other young women are telling us where they went and with whom they are spending their time.

What kind of selfies you post predicts your self-efficacy. In other words, those who objectify themselves have lower self-efficacy than those who don't. If you have a daughter in her teens or early twenties, this information might help you

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In our study,
88 percent
of participants took
selfies on a daily basis.

as a parent. It tells you that if your daughter is in the habit of posting sexy selfies, she's less likely to believe in her ability to solve problems and change the world around her.

Winning the Looks Battle With a Double-edged Sword

These findings make a lot of sense. There are objects and agents in the world—those who can do and those who can't. If you make yourself an object, you may be robbing yourself of agency. This takes me to another personality type we measured: the idea that your self-worth is based on your looks. We found a fascinating paradox here. The tendency to think that self-worth is based on looks predicted both feeling gratified and feeling insecure when

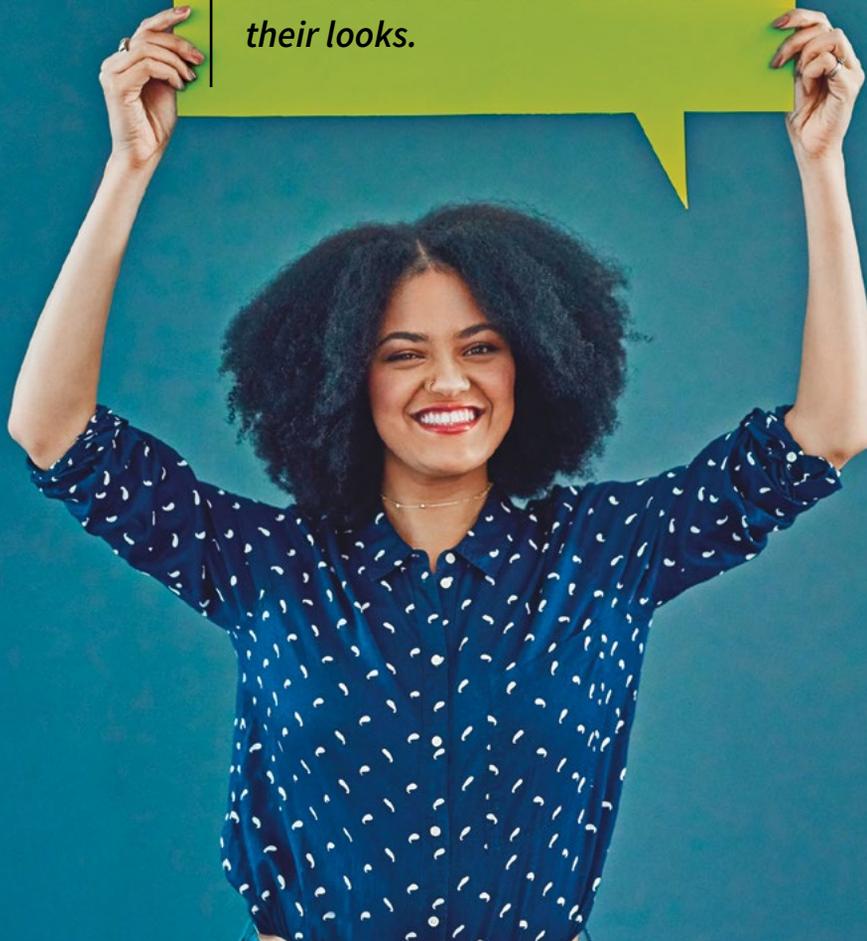
looking at selfies. In other words, if you think your value lies in your looks, you may feel either of these because you think your looks matter. On the other hand, if you don't feel your looks are what matters, you may feel neither gratified nor insecure while looking at selfies.

Those who were more narcissistic posted more appearance-focused selfies, while those who were less narcissistic did not. Narcissists spent more time looking at selfies and felt more gratified when they did. Posting selfies that weren't about appearance was not predictive of narcissism. What does this mean? If you're in the habit of posting images of yourself that are supposed to be about your physical attractiveness, you're probably more



The most common types of selfies in our study were photos taken at special events (33 percent) followed by beauty shots (31 percent) and photos showing spending time with friends (29 percent).

Because we were interested in self-images of young women, we wondered how much they thought their self-worth was based on their looks.



narcissistic. If you're in the habit of posting pictures of yourself showing what you're doing or the fact you're with friends, then this doesn't predict narcissism.

The Selfie Story is Not Black and White

All of this is to say that there's more than one type of selfie to post, and there's more than one type of person who posts selfies. So, how could there be a black or white conclusion that selfies are good or bad?

It's sort of like asking yourself whether TV shows are bad or good—or if even if books are bad are good. You'd want to know what kind of TV show you are talking about and what the viewer is like before you made any generalizations.

Ours is far from the only research to offer the perspective that when it comes to social media, you can't make a generalization that the entire enterprise is bad or good, especially without referring to social media habits and people's personalities. For example, several research studies have been published about social media use and depression and anxiety.

Social Media Use and Depression/Anxiety

A major review⁸ of the research on depression, anxiety and social media use shows the impact of social media on psychological health is likely complex. Some of the studies reviewed indicated social media use predicted depression and anxiety, while others showed the opposite.

Furthermore, whether your social media use ends up being more of a risk or an opportunity may be related to how you use social media. For instance, there's some evidence that interacting (for example, clicking the "like" button or leaving a comment) is predictive of more positive outcomes than so-called "lurking" behavior, including monitoring your ex's social media posts without announcing your presence.

Depression predicted negative social media interactions as well as social media overuse and social media addiction. On the other hand, those who scored low on depression scales had more friends, more positive social media interactions and were more likely to think they compared well with their social media "friends." Negative thinking patterns predicted negative social media posts.

Social Media and Common Sense

If much of this seems like common sense to you, there's probably some truth in that. But one problem is that conflicting findings might both seem like common sense. If your co-worker tells you social media use is bad for you, you might think he has a point. However, if your neighbor

The Actuarial Connection

Self-efficacy is a key personality trait that drives the success of products like John Hancock's Vitality product, which is linked to Fitbit physical activity tracking devices. If you have high self-efficacy, you will respond very well to the gamification and reward components of this product, because people with high self-efficacy respond well to challenges to improve their lives.

comments on how great it is to keep up with his grandchildren on social media, you probably think that makes sense as well. The research backs up both of them—there's not just one way to look at social media. The rosy glow and the gloom and doom—neither tells the whole story. If your sister says she's worried about her daughter's social media use, some key questions would be to ask what her daughter is like and what kinds of things she does on social media.

Status: It's Complicated

It may seem like a small thing, but having conversations that go beyond "it's all good" and "it's all bad" would represent progress in our everyday understanding of the impact of social media on our health. As a media psychologist, one thing that would make me very happy would be if in every conversation about media, people remembered that the news is not all good—but it's not all bad either. ■

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WOMEN IN MEDIA PSYCHOLOGY

Dr. Karen Dill-Shackleford, Dr. Regina Tuma, Dorothy Andrews (PhD student), Dr. Jerri Lynn Hogg, Kerri Lemoi (student), Dr. Pam Rutledge



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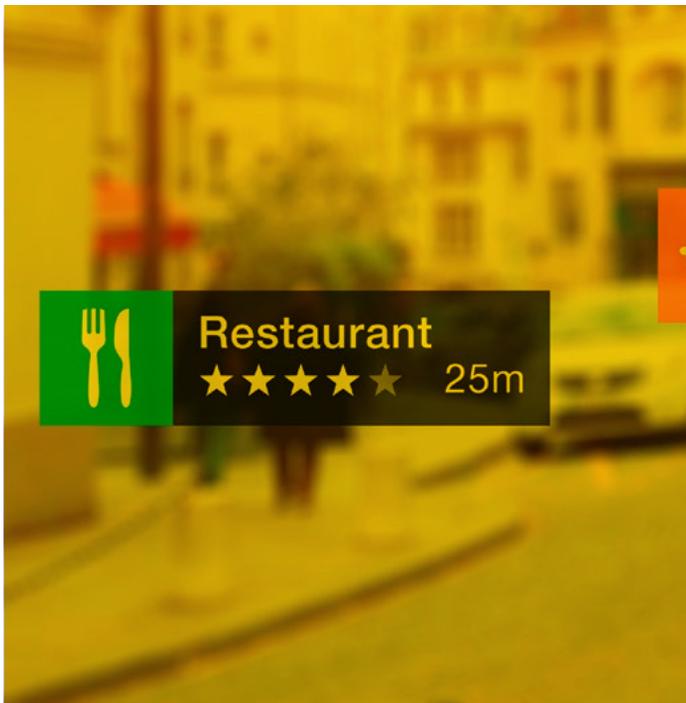
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Dorothy Andrews (pictured above) is the Chief Behavioral Data Scientist and Actuary for Insurance Strategies Consulting LLC. She has more than 25 years of actuarial and statistical modeling experience with insurance companies and government agencies. Insurance is becoming more mediated by mobile, wearable, and AI technologies. As generations become more disconnected media technologies, leveraging media psychology, actuarial science, and data science is vital to the predictive future of insurance. Dorothy is currently working on a PhD in Media Psychology where she is studying how media technologies are affecting perceptions of risk aversion, neutrality, and affinity.

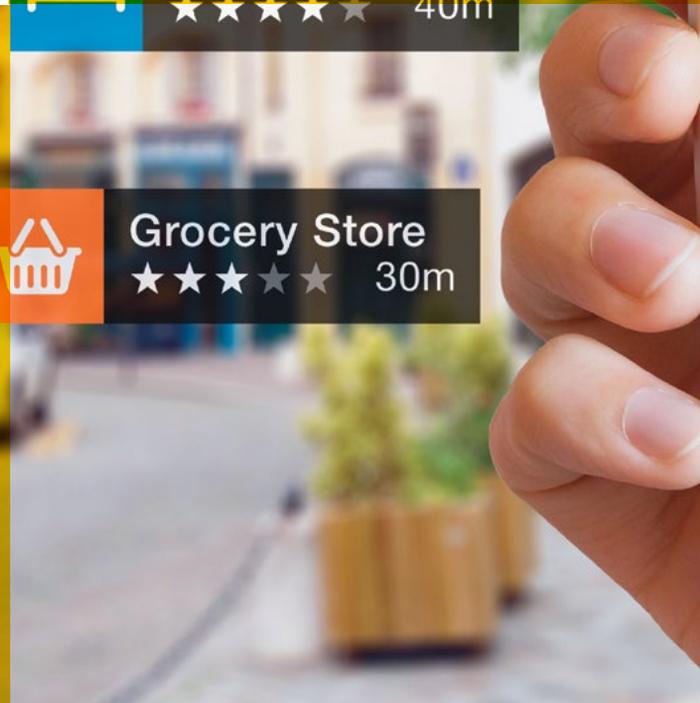
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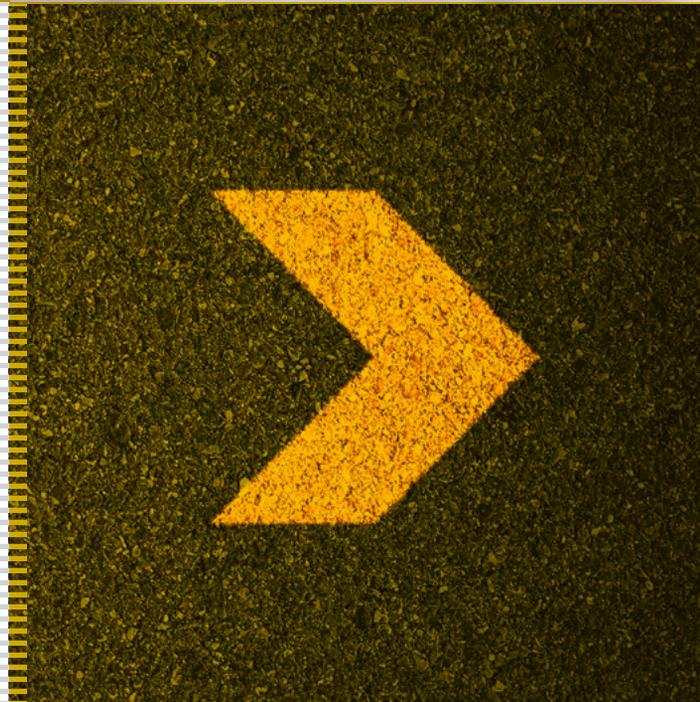
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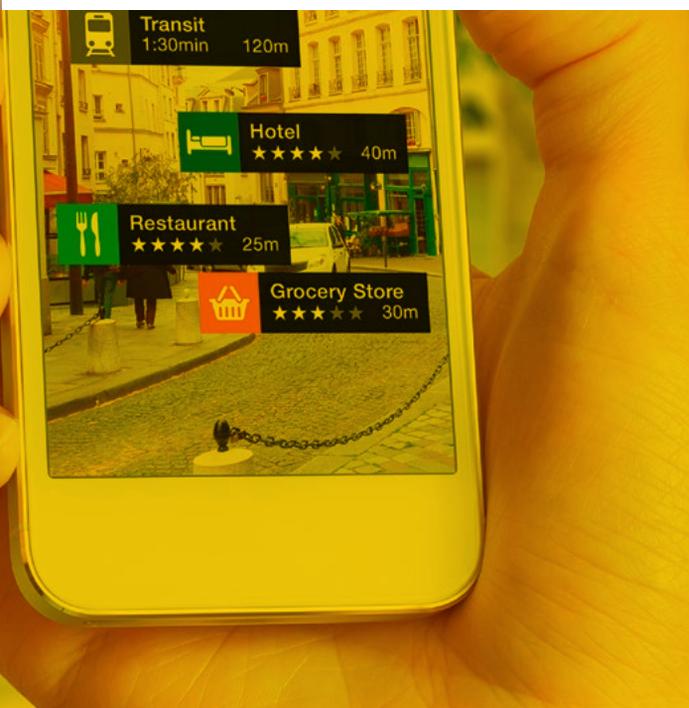
BY JERRI LYNN HOGG

Using technology to improve lives—and media psychology to understand how



F

rom seniors and those living with disabilities, to all of us seeking optimum health and well-being, technology promises better living. There are a lot of great technological ideas designed to make our lives easier and address hard problems. We are texting, emailing and posting to social media more than ever. Adults spend nearly half of their day interacting with media,¹ a full 78 percent of teens check their devices at least hourly,² and U.S. children younger than 8 spend 48 minutes a day on average on a mobile device.³ In 2015, more than 2 billion people used social media



networking sites and applications.⁴ This represents considerable engagement with digital technology.

By 2025, it is estimated that immersive reality (virtual, augmented and mixed reality) in health care will reach \$5.1 billion. In 2017, health care was considered the second strongest vertical in terms of funding in Europe. Technology can be used to assist and empower patients, provide access to helpful treatments and offer better diagnostics. We can change the face of health care.

Pew Internet researchers state: “Digital life will continue to expand people’s boundaries and opportunities in the coming decade and that the world to come will produce more help than harm in people’s lives. Still, nearly a third think that digital life will be mostly harmful to people’s health, mental fitness and happiness.”⁵

As a media psychologist, I study how media and technology influence our lives. Currently, I am working on research to provide scientific outcomes as well as positive psychological benefits of technologies to further garner support from the medical community, funding sources and insurance companies. Technology has the potential to generate and support positive well-being. I use the lens of media and positive psychology to inform my research. I review the science underlying emerging technologies for improving mental and physical health, and I consider some of the current implementations already affecting our lives.

Positive Psychology and Positive Health

Researchers describe positive psychology as “the study of what is ‘right’ about people—their positive attributes, psychological assets and strengths.”⁶ Its goal is to identify factors that help individuals grow, adapt and thrive in society. By helping individuals thrive, the communities they comprise also grow stronger and healthier.

The positive psychology movement originated in the late 20th century under the guidance of psychologist Martin Seligman and others. In 2000, Seligman and fellow psychologist Christopher Peterson conducted a global study on what is best about being human. The results of the study generated the VIA Institute on Character Classification of Character Strengths. This list includes 24 specific identifications of strengths,⁷ including categories such as creativity, honesty, courage, love and fairness.

Character strengths are signature strengths that identify who we are and how we lead and/or approach a situation.

So, for example, I have taken the VIA Survey test multiple times. Each time, my results showed curiosity at the top of my profile. At first, I was surprised by—and even disagreed with—the results. I didn’t think of myself as a curious person—or at least I didn’t think it was one of the primary traits I display with my behavior. Over the next week, I noticed how many times I started a sentence with “I’m curious...” Then I thought about my career as a researcher and a media psychologist and realized I am, in fact, curiosity driven, always interested, exploring and wanting to know more.

Dr. Ryan Niemiec, director of VIA education, and Alina Yarova, vice president of the positive health and wellness division of the International Positive Psychology Association (IPPA), reviewed research with application of character strengths and health in their Spring 2018 research newsletter.⁸ Some examples include:

- » Gratitude has been linked with increased positive mood, life satisfaction, vitality, optimism and spirituality, and decreased depression and envy.⁹
- » Hope was a significant predictor of medication adherence among asthma patients aged 8 to 12 years.¹⁰
- » While telomere length was negatively associated with chronological age, a belief in personal justice mediated such an effect for older subjects, suggesting perceptions of justice/injustice could be protective from the negative health effects of race-based social adversity.¹¹
- » All character strengths except humility and spirituality were associated with multiple health behaviors, including substance avoidance, cardio-respiratory fitness and overall perceived health.¹²

VIA character strengths have been empirically validated and used to generate well-being. Multiple experiments and longitudinal studies have shown that positive emotions provide benefits in work, family life and financial status.¹³ These findings

support the notion that building on psychological strengths individuals already possess can increase personal resiliency and contribute to mental and somatic health for individuals and communities. By knowing your character strengths, you can better identify how to approach and manage problems, reduce stress, strengthen relationships and increase life satisfaction in general.

This insight follows another contribution from Seligman. In 2008, he proposed the creation of a new academic discipline he named “positive health.” Seligman’s positive health philosophy defined health as “a state beyond the mere absence of disease.”¹⁴ Unlike the medical model—where the approach is to identify disease and problems and try to fix them—the positive psychology approach falls more along the lines of what is working and how we can lead with, design for or model to the strengths. It is an empowered approach that allows for bringing out the best. Once developed, Seligman predicted, positive health measures could be used to estimate longevity, medical treatment costs and prognosis, mental health, and quality-adjusted life years and disability-adjusted life years.

Applying Positive Psychology to Improve Health Outcomes

The research cited in this article, as well as many other studies, has demonstrated the benefits of nurturing psychological resources such as resiliency, optimism and gratitude in improving mental health. They have also been found to increase the benefit of public health interventions.¹⁵ Many of these include technology-based interventions designed to identify, prevent and alleviate negative outcomes of mental health challenges. Names such as “positive computing” and “positive technology” describe initiatives to promote mental health and well-being by applying positive psychology to human–computer interactions. Sarah Diefenbach, a professor for market and consumer psychology at

the Ludwig-Maximilians University of Munich in Germany, writes that “‘positive technologies’ are designed to manipulate the quality of experience through its structuring, augmentation and/or replacement, with the goal of increasing wellness, and generating strengths and resilience in individuals, organizations and society,” while positive computing aims to “study and [aid in the] development of technologies designed to support well-being, wisdom and human potential.”¹⁶

Based on these findings, an interdisciplinary community including psychologists, technologists, user interface designers, game makers and others have begun developing ways to use computer-based algorithms and interactive technologies to “support well-being and human flourishing.”¹⁷ Current examples include ubiquitous cellphone and smartwatch pedometers and fitness trackers, which leverage the individual’s desire for self-efficacy, reminding users to exercise,



The positive psychology model tries to figure out what is working and how we can lead with, design for or model to the strengths. It is an empowered approach that allows for bringing out the best.

relax, drink water or perform other positive activities.

Emerging Technologies for Positive Psychology and Health

Equally intriguing but perhaps less obvious applications are emerging from the computational field of big data. Algorithm-based processing models increasingly are able to scour large data sets, including social media posts, to identify opportunities for mental health interventions.¹⁸ One well-intentioned but potentially clumsy example gained attention in the U.S. news media recently: Facebook scrubbed user posts for indicators of suicidal ideation. Unfortunately, news reports claimed Facebook’s technology resulted in many false alarms and too-late alerts.¹⁹ Nonetheless, other recent news stories reported on research at the University of Chicago that was working to predict suicide risk based on indicators as subtle as text typing speed and word choice. Researchers from the National Institute of Mental Health estimate that “as many as 1,000 smartphone ‘biomarkers’ for depression” may exist.²⁰

As technology matures, big data algorithms are likely to learn to detect signs of impending or emerging mental health conditions as accurately as Google’s present search engine technology is able to detect influenza hotspots based on the location of users seeking information about symptoms and treatment. In mental health, this information could be used to identify opportunities for public health or policy interventions, and then results can be measured. Additionally, these technologies promise even greater granularity, identifying individual sufferers and triggering interventions designed to mitigate conditions such as manic episodes or depressive relapse. Pilot studies suggest interventions such as this can provide moderate benefits to sufferers.²¹ These outcomes are likely to improve as technologies mature, ultimately improving community well-being by decreasing

the number and severity of depressive conditions in the population.

Perhaps the most powerful future technology for positive health promotion is already well-known. The worlds of computer-based gaming, scientific research and military training have all invested heavily in the hardware and software that support virtual reality (VR), defined as using imagery, sounds and even physical sensations such as motion and vibration to create an artificial environment in which users can interact with others or imaginary objects. Good examples include slaying trolls and zombies in electronic games or practicing combat missions in sophisticated flight simulators. Even using two-dimensional screens in goggles or headsets, this technology has demonstrated the ability to evoke the same emotional responses as in real life.

Researchers note that VR environments are able to induce positive emotions such as awe using scenarios that cause affirmative visceral responses in participants.²² Anxiety and stress reduction VR applications are available with measurable positive results. Research suggests this is based in VR’s ability to let users inhabit a shared virtual space,²³ resulting in communications and interactions that are closer to “face-to-face” interactions than is possible with thinner media such as texting, phones and even video conferencing. VR can also “transport” participants to comforting environments and “democratize” other experiences such as visiting foreign lands, ascending unconquerable mountain peaks and even traveling in space.

Lingering Questions in Positive Health

There are a lot of great technology ideas designed to make our lives easier and address difficult problems. Now that technology is woven into the fabric of our everyday lives, two important questions remain. The first is, how can we best use these technologies to live a good life? The second question is, how can we safely use technology to assist in promoting well-



As many as 1,000 smartphone “biomarkers” for depression, such as text typing speed and word choice, may exist.



As with any emerging technology, computer-based positive psychology and positive health solutions demand careful study as they are introduced and adopted.

being while not diminishing the quality of our lives? This is particularly poignant as we live in an ever more technology-driven world.

The answer to these questions may be found through the lens of positive psychology itself. Some criteria to keep in mind when determining the value, utility and benefit of current and emerging technologies—that is, deciding whether to “trust” them—include:

- » Does the technology empower the user?
- » Can it assist in providing a voice to the consumer (act as an advocate)?
- » Can the user feel a sense of agency by using the technology?

CHOOSING HAPPINESS

“You’re always so happy, Olga.” I get a chuckle when someone tells me that. I believe I am a generally happy person and am glad I come across that way to others. Some who make that observation about me or about others like me think that happy people are just “born” that way. They think we’ve had no misery, no hardships in life, and that we are always “winning” or “lucky.” That experience is certainly not mine—yet I am happy.

I am happy because I choose to be. Every day I wake up and count my blessings. I thank God that my family and I are healthy. Even though I read the morning paper every day and practically every article is negative, I make sure to close out the paper with reading the comics. I also define myself as broadly as possible—meaning I don’t think of myself solely as what I do for a living. I don’t let my work accomplishments or my work disappointments define me. I don’t allow my daily happiness to be defined by whether good stuff or not-so-good stuff happened at work that day.

I think of all the other roles I have every day: wife, mother, family member, friend, mentor, Society of Actuaries (SOA) volunteer. I let the “complete me” be my gauge for my frame of mind, and the gratitude of playing all of those roles further increases my level of happiness.

Why does happiness matter? Well, do you want to walk into a business meeting surrounded by happy people or angry people? Better yet, happiness has an impact on your health! A recent Harvard study found “most optimistic women had a 16 percent lower risk of dying from cancer; 38 percent lower risk of dying from heart disease; 39 percent lower risk of dying from stroke; 38 percent lower risk of dying from respiratory disease; and 52 percent lower risk of dying from infection.”¹

So, tomorrow, read the comics, spend time with your friends and be happy!

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Dr. Laura Kubzansky of the Harvard School of Public Health is studying “happiness” as a deterrent to and aid for the healthful management of diseases such as strokes, heart attacks, diabetes and depression. The four attributes of happiness she has identified are emotional vitality, optimism, supportive networks and self-regulation.

As with any emerging technology, computer-based positive psychology and positive health solutions demand careful study as they are introduced and adopted. But unlike many technology products, these new systems and applications provide so much potential for improving mental and physical health among individuals and communities. Technology will continue to grow and, in the process, create efficiencies, make our lives easier and make possible what we once thought was impossible.

How might you promote the positive features of human psychology that can be leveraged or amplified using media and technology? Find your signature strengths and take the 10-minute survey for free at ViaCharacter.org. ■

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YOU CAN LEARN A LOT BY LISTENING

Use narrative analysis to understand the “why” in consumer behavior trends

BY PAMELA RUTLEDGE





We all have watched the digital revolution disrupt a century of economic, social and political norms and bring a variety of new opportunities—as well as unfamiliar and complex problems—across our desks. As a media psychologist and researcher, I am excited by the new approaches to audience analytics enabled by the digital and social technologies that let us “listen” to the consumer. Buzzwords such as big data and sentiment analysis reflect our eagerness to put large-scale data gathering and sophisticated analytical tools to use in hope of capturing new insights and improved predictive capabilities. The avalanche of data techniques and allure of new insights, however, can distract us from remembering three key facts:

- 1 | Data is about people.
- 2 | People adapt to changes in their environment.
- 3 | Data measures past activity, not what consumers will do in the future.

Integrating media psychology frameworks such as narrative inquiry into data analysis enables us to dig deeper and learn who our consumers really are and what they really want. Narrative patterns can reveal the stories and cognitive belief structures behind consumer behavior. This approach adds a depth of understanding to quantitative analysis and can improve our confidence in predictive analytics. It also gives us actionable insights to position products and processes to satisfy the customers of the future.

Measuring Behavior in Changing Times

Predicting human behavior requires us to make assumptions about cause and effect, which are proxies for the consumers’ priorities, motivations and goals. Due to habit, history or management directives, we may not question the underlying assumptions behind our analytical processes.

While expedient, “doing business as usual” may perpetuate embedded cognitive biases that cause us to overlook the effects of our continually evolving media and technology-rich environment on consumer needs and expectations. We know that consumers, ourselves included, are adopting new ways to discover, connect and transact with information for both work and play. In doing so, consumers establish new behavioral norms that reflect changing life priorities and a redefinition of some very important beliefs—like what constitutes success, safety and acceptable risk.

Media psychology studies the implications of this intersection of human experience with media technologies. As a media psychologist, I use various tools to mine social media data for emerging themes and narrative patterns to shine a light on what matters to my clients: how shifting consumer beliefs, motivations, needs and goals impact engagement and product adoption. Narrative analysis brings in the human component. To be clear, it doesn’t replace quantitative analysis. It is a valuable addition that can provide a check on the behavioral assumptions and probe for deeper understanding to produce more robust audience profiles and actionable insights.

Consumer behavior is a manifestation of internal motivations and goals that reflect beliefs, assumptions and innate cognitive patterns in the context of socio-cultural experience. In a changing environment, behavioral drivers are fluid, not fixed. The confidence we had in predicting the future from historical behaviors is eroding. Relying on the past puts us all at risk of missing critical changes in future behavioral trends.

We know people adjust their behaviors in response to technology. It is not true, however, that technology works in reverse. Yes, behaviors change, but deep-seated needs and goals do not. People are driven by the same primary needs that ensured

MEDIA PSYCHOLOGY 101

Self-determination theory highlights the primacy of human connection, a sense of control over one's actions and the ability to take action and achieve results.¹ Recognizing these drivers helps us understand the adoption patterns of new technology and the appeal of technology-driven interfaces that increase consumer control over actions such as information acquisition and purchase paths.

Instinct refers to both research and theory from neuropsychology and evolutionary psychology. It includes the primal reactions from the “fight or flight” syndrome, the need for certainty, and subconscious cognitive frameworks and emotional responses that impact information processing and decision-making.^{2,3,4} These theories provide insight into how humans innately approach or avoid information and situations in ways that are critical to content creation, product design and consumer experience.

Social influence is encapsulated in a set of principles that describe how innate reactions to the behavior of others influence attributions, reshape perceptions and shift norms. For example, celebrity and popularity confer value on associated products, creating a halo-effect that can influence identity and the sense of affiliation through consumer adoption. Marketers have long taken advantage of the innate tendency of people to feel obligated by “free” gifts.⁵ The emerging field of influencer marketing demonstrates a shift from traditional authorities to credibility through social proof and access to markets unavailable through traditional channels. Sonnet Insurance, for example, is connecting with Canadians through experience partnerships on Instagram with the Toronto Blue Jays and World Cup Hockey, and encouraging user-generated content.⁶

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their social and physical survival when we all roamed the savanna. Changes in technology enable people to pursue goals in different ways. Applying psychological science to technology allows us to get in front of trends. Like a surfer waiting to feel the swell, it lets us monitor movement in the sea of narratives.

Three theoretical groupings form the root of my approach to narrative analysis and allow me to tease out the “why” in the “what” of the data analysis.

- ① | The innate drive for social connectedness, agency and self-efficacy
- ② | Instinctive responses
- ③ | Social influence

This theoretical foundation allows me to make sense of patterns and trends. For example, people have flocked to social media in spite of consistent press coverage on the negative impact of virtual connections. Why? Empirically, it has been shown to have many positives that manifest in consumer narratives, such as the ability to facilitate the creation of social capital,¹ support intimate relationships,^{2,3} and enhance individual agency and civic participation.⁴ The popularity of streaming entertainment and the ability to watch more than one episode of a show at a time, called “binge-watching,” underscores the changing patterns of viewer behaviors in response to the prevalence of portable and navigable streaming devices. It also indicates a more fundamental shift—the consumer’s desire for increased personal control over leisure activities and devices.⁵

Redefining Normal

There is a lesson for all businesses as we watch revenue from the global streaming companies like Netflix outflank box office sales.⁶ This is a trend toward increased individual agency that is disrupting many industries. As consumers realize they can have more choice and control, they increasingly demand it from the products and services they choose. Access to social technology, content and services in real-time—whether on Snapchat, Google Scholar or Amazon Prime—is changing expectations and priorities as they redefine social norms.

Social norms are critical because they define the socially accepted “need” for any given product or service. We are seeing marriage and childbearing at older ages, delayed homeownership due to increased costs, and career paths adjusting to longer life expectancy. These trends, amplified by digital technologies, redefine what it means to be an “adult” and to have a life well-lived. These changes in turn impact perceptions of risk, success and safety.

Narrative analysis can identify the difference between behavioral shifts versus lags, highlighting new needs. Millennials who use Uber or Lyft instead of purchasing automobiles don't need insurance. This trend also signals the preference for engagement via mobile devices. Understanding “why” helps companies design the right financial products.

Looking for “Why”

Narrative analysis has two main strengths:

- 1| It captures the complexity of media experience in social context.
- 2| Narrative shows the subjective and storied nature of life.

For consumer profiling, analyzing narrative patterns allows us to deconstruct the stories people tell about themselves and others. These stories expose perceptions, beliefs, priorities and desires, allowing us to derive insights about consumer intention and product-related cognitive frames.

Intention in Image

A valuable marker for intention is “image language”—evidence that a customer can “see themselves” using a company’s product. Because imagery is the precursor of symbolic representation, or language, the reference to image often reflects precognitive desire and perceptions of agency that lead to intention.

Cognitive psychologists have long recognized visualization’s role in behavior change. Similarly, narrative researchers have identified visualization as the critical component in the persuasiveness of a story.⁷ Every planned action is accompanied by a visual image so we can see the steps necessary to accomplish our goals. We look for the presence of image in language as an indicator that desire has moved to intention. The visualization of a solution, such as buying insurance, is more potent than the need alone because it establishes the behavior path for goal attainment.



A WORLD OF QUICKER-THAN-EVER RESPONSE TIMES

Amazon’s business practices have changed our expectations about how long it should take to receive what we buy online. By offering Amazon Prime subscriptions that include “free” two-day delivery, they have made shipping a critical part of the value-proposition for all online shopping experiences. “Free” and “two-day” shipping are now a benchmark that has had a ripple effect for competitors and shipping services alike, forcing other companies to step up their games.

But beware! This time squeeze affects more than packages. Expectations of a fast response extend to other forms of customer service and engagement. Recent research found 84 percent of consumers expect a response to an email in less than 24 hours.¹ The acceptable time for a response on social media is just a few hours. Longer time frames can be perceived as disrespect or signal that a company is out of touch with today’s consumer.

Perhaps even more daunting to many companies, 81 percent of consumers expect businesses to recognize, link and acknowledge conversations from all points of contact—chats, social media and emails—as part of the ongoing company-customer relationship.² Consumers are now multichannel and expect your company to be there, too.

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QUALITATIVE RESEARCH IN A BIG DATA WORLD

Qualitative research traditionally has been restricted to small samples due to the time-consuming nature of the analysis. Thanks to innovative software programs, it can now be applied to social media's large data files using text-based natural language programs that sort words and show networked relationships.

The process is not foolproof. The idiomatic idiosyncrasies of conversation on platforms like Twitter, the variations across demographics and cultures, use of emojis and the tendency of people to respond in semantics reflecting affiliation with the source have made machine-generated analysis of constructs like sentiment difficult to operationalize without a human getting involved. There are tools, however, that enable a qualitative approach at scale while still allowing for manual oversight and manipulation.

Tools such as the software program Leximancer¹ and the market analytics tool Quid² are among those that allow us to process large data files and identify preliminary thematic groups and narrative patterns—and visualize relationships at the macro level—while retaining the ability to dive into any single data point for subjective confirmation of the narrative analysis.

As with most qualitative research, the critical phase—and the really hard work—is translating the output into supportable theoretical hypotheses to derive actionable insights.

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Narratives Are Frames

Throughout narrative analysis, we group, code and decode language and comments to identify the “frame” of an audience. Frames are innate mental structures that influence how we see the world. If a message doesn't fit our frame, we ignore it.⁸ Frames form our natural cognitive processing patterns, guide our decision-making⁹ and impact our interpretation of information. For example, many people hold the frame that flying is more dangerous than driving in spite of staggering statistics to the contrary.¹⁰

Narrative analysis helps us identify consumers' frames and expose perceptions of value and causality. We use frames to evaluate how well a consumer understands a company's product and if the product is the exemplar (leader) or a follower in its category. A brand with a strong exemplar position becomes the label for its category—think Jell-O or Geek Squad. Identifying frames allows companies to construct more effective communications. When the message-frame fits salient consumer frames, the messages are more persuasive—whether it's changing health behaviors or encouraging product purchases.¹¹

Examining frames is equally important from the company's side. Consumer analysis can uncover discrepancies between the company's frame and the consumer's actual goals that, unexposed, can thwart adjustment and innovation. Kodak, Blockbuster, Nokia and Borders are a few of the companies that stuck to their own frames and failed to innovate.^{12,13}

Reframing: Actions Follow Beliefs

Changing the frame, or reframing, drives most marketing communication. Successful reframing allows the consumer to see things in a new way while increasing personal relevance, perceptions of need and buy-in. Without care, however, frames can constrain the value proposition. Something as simple as pricing can influence perceptions of a product being a good or bad deal. Consumers routinely perceive prices ending in .99 to be significantly lower than a price one cent higher (e.g., \$2.99 versus \$3.00).¹⁴

Reframing can effectively communicate a misunderstood brand or product. Canon effectively reframed its brand from a camera company to a more customer-centric storytelling brand.¹⁵ Marketers who are blinded by their own frame are in danger of creating campaigns that don't deliver. Pepsi did not understand the frame accompanying *#BlackLivesMatter*, and its reputation suffered from a commercial showing a pop culture celebrity “solving” social injustice with a can of Pepsi.¹⁶ Nationwide Insurance underestimated social norms, generating negative responses by running ads emphasizing accidental child death scenes during the Super Bowl in 2015.¹⁷

Conclusion

Processes and assumptions become institutionalized in all businesses. The seismic social and environmental changes enabled by the internet and mobile access are amplified by coincident demographic shifts, as millennials begin to outnumber baby boomers and the U.S. population continues to become more culturally diverse. Social media data, while idiomatic and varied, can capture consumers' stories so we can monitor

Sentiment analysis can be used on the nursing narratives of hospice patients to predict when a patient might discharge from hospice care to seek aggressive treatment, transfer to another facility, revoke their care due to an improvement in condition or in the event of death. This type of predictive model can aid in the analysis of expected Medicare reimbursements.

Throughout narrative analysis, we group, code and decode language and comments to identify the “frame” of an audience.

Understanding the “why” along with the “what” of measured behavior is very powerful.

changes in priorities and behavioral trends that don’t emerge in historical data.

Understanding the “why” along with the “what” of measured behavior is very powerful. Connecting big data with human experience gives us the ability to identify the consumer beliefs, priorities and intentions that manifest in purchase and engagement behaviors. These result in actionable insights throughout the product pipeline, and perhaps more important, create a process for improving the responsiveness and adaptability of future strategies. ■

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Human-computer Interaction

BY DAVID SIMMONS

The actuary's next behavioral science toolkit

64 6f 20 79 6f 75 20 75 6e 64 65 72 73



“

64 6f 20 79 6f 75 20 75 6e 64 65 72 73 74 61 6e 64 3f.”
Do you understand? Unless you are a computer with a hexadecimal translator, this series of alphanumeric characters should not mean much to you. However absurd this question may seem, there was a point in time when programmers had to create coding at this level of interaction with machines. In this article, we will explore how human–computer interaction (HCI) will and has transformed our industry through both the tools we use and the ways we communicate. We will utilize the studies of HCI and reference impacts of behavioral economics (BE) on our industry to demonstrate how these lessons influence our work.

Parallels Between BE and HCI

From a systematic perspective, behavioral economics can be viewed as a disconnect/entropy between data coming into a human constraint and the resulting decisions made. For example, choice overload is a BE concept by which eliminating the number of choices results in an individual having less difficulty in making a decision. From a purely efficient market view, this makes no sense, as optionality in a vacuum should only lead to better outcomes. As such, we have an issue with a human element needing to take in information and limitations of that human on effectively processing all the data.

Much like behavioral economics, the financial industry frequently utilizes HCI without thinking about the structured context. HCI can be viewed as a disconnect between the data a machine has aggregated/computed and the human being able to interpret and determine actionable insight. Due to this disconnect, we present graphs instead of spreadsheets full of numbers—just as the human benefits from fewer choices in a BE world, the human benefits from a less detailed, graphical illustration in the HCI world. Appreciating how internal technology has progressed to cater to HCI and these resulting disconnects may provide some insight on what the future holds.

Driving the Tools We Use

One of the most widely used tools in the actuarial profession is arguably the spreadsheet. VisiCalc, the original predecessor to our spreadsheet applications, was created, as the name suggests, to serve as a “visible calculator.” The display on VisiCalc showed multiple rows on the screen rather than just the current number in a calculation. This visual structure helped to remove the memory requirement for interacting with a calculator with only one row.

After VisiCalc, Microsoft Excel entered and dominated the market. Excel was better structured to depict



CLOUD PLAY

While actuaries are familiar with SQL and Microsoft Excel, and can use these applications to prepare data for consumption, these applications are not without fault.

With the ever-increasing volume of data, desktop applications such as Excel and Access can quickly reach their limit. To overcome such constraints, cloud computing has introduced concepts of elasticity and scalability, where computer resources grow and shrink on demand and without constraints.

Imagine a future where:

- 1 | Low-cost cloud data storage or data lakes (like Amazon S3) collect and store data.
- 2 | Elastic compute clouds (like Amazon EC2) run powerful programs like Python or PySpark to clean, transform and structure the data.
- 3 | Scalable data warehouses (like Amazon Redshift or DynamoDB) store structured data.
- 4 | Business intelligence tools (like Tableau, Power BI or Microstrategy) consume data to unlock its potential.
- 5 | All of these tools work in concert with each other without any manual intervention, through workflow and robotic process automation.

This architecture can provide a solid foundation for developing essential reporting and analytical capability given the volume of data and the speed at which it is generating today.

This future is here. Many insurers have already adopted such technologies to support their actuarial workforce and equip them with the resources they need. Traditional actuarial analytics like trends, roll forwards, experience analysis, hedging and asset liability management analytics can be produced within minutes—no matter how large the data set or how many millions of records need to be analyzed. As a result of these improvements, actuaries have been able to shift a significant amount of their time from preparing data to performing value-adding analysis. In addition, the affordability of setup and maintenance of this architecture is helping to make a strong business case. Now, who would refuse that?

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ITEM	NO.	UNIT	COST
MUCK RAKE	43	12.95	556.85
BUZZ CUT	19	4.95	94.05
TOE TONER	258	4.95	1277.10
EYE SNUFF	2	4.95	9.90
SUBTOTAL			1315.50
9.75% TAX			128.25
TOTAL			1443.75

VisiCalc

Row Labels	Sum of Cost
Buzz Cut	101.25
DE	33.75
MD	33.75
NY	33.75
Eye Snuff	9.9
PA	9.9
Muck Rake	556.85
CT	103.6
DE	259
MD	64.75
NY	129.5
Toe Toner	1248.75
CT	1248.75
DE	4995
MD	3746.25
NY	2497.5
Grand Total	13155.5

Microsoft Excel

and process spreadsheet information through the use of pivot tables, graphs and database connections. These additional functions were built from a spreadsheet base to help better communicate data with the end users.

While actuaries are familiar with the power behind pivot tables and the aggregation of data, pivot table presentation is still only textual, and it takes a significant amount of brainpower to process large sets. Tableau takes this visualization one step beyond and turns those rows and columns of a pivot table into “dimensions,” “measures” and “marks.” Dimensions are viewed as categorical data, while numbers are assigned to measures. Marks can be interpreted as more details that we want to visualize in the graphics, such as colors and size. By aligning data to these constraints, the human user can easily categorize the data and understand where each variable should be substituted into a graphical representation.

This increased emphasis on the end communication, however, is not a panacea. One of the widely documented behavioral aspects of humanity is that we tend to be very good at finding patterns. In fact, we are so good at finding patterns we often find them when they don't exist.¹ Much like overfitting is possible in modeling, it would not be a stretch to state that these tools can be used to tell stories that are misleading to ourselves and others. Additionally, there are limitations on both the front (data preparation) and back (intelligent analytics) sides of the Tableau experience. During data cleaning and preparation, many Tableau users find themselves working in Excel and performing SQL queries just to get data into a usable format. On the back end, there are several analytic overlays available such as trends, forecasts and clustering, but this is far from an extensive list. Furthermore, it is not a seamless experience to incorporate R, Python or other more analytic-heavy technologies.

In the future, more solutions will exist to address these HCI issues around data collection and modularity of incorporating other technologies. There are already third-party data providers that collect, interpret and clean publicly available data. Cloudera, IBM, Microsoft and



Tableau

VisiCalc (left) was the original predecessor to spreadsheet applications. It was obsoleted by Microsoft Excel (center), which is now being complimented by Tableau (right) for its ability to take data visualization one step further.

countless other data management companies are creating interfaces and tools for deeper analytics. Tableau also released a separate “Prep” software aimed at addressing some of these issues.

Driving Product Decisions

Humans experience more pain from losing a dollar compared to the joy experienced from gaining one. In behavioral economics, this is an example of loss aversion inherent in our thought processes. Companies have adapted to these preferences by developing new products and features. Managed volatility funds, for instance, can be seen as an attempt by variable annuity departments to address the concept of loss aversion. Generally, these funds sell some level of upside potential in exchange for a more level stream of returns.

Just as the insurance industry has adapted on the consumer front to consider behavioral economics, it has and will adjust to consider customer HCI. Insurance has had a reputation for being complex and needing to be “sold” to customers. But that begs the question: Should the sales of insurance to consumers be so complex? Is the concept of being paid by a property and casualty (P&C) company for a product warranty or by a life insurance company upon a death really more complicated than coordinating a driver to pick me up and take me to a random destination through a ride-sharing company like Uber? It heavily comes down to the human interaction and the presentation to the customer.

Often in behavioral studies, there is a focus on humans as the limitation in a more efficient outcome. However, where there are weaknesses, there are also strengths that are important to recognize and utilize. In fact, technological innovations often are simply trying to mirror how humans naturally try to interpret data. Some companies have stood out as being more proactively focused on their interaction with technology. Lemonade is one such P&C company that has emerged, offering instant home and renters’ insurance. Protective has some life insurance offerings alongside student loan consolidations. Life insurers as a whole have moved toward simplified issuing. Several home insurance companies have adapted products

The Actuarial Connection

Human-computer interaction (HCI) is the study of how humans interact with technology. Insurance products and analytical tools have evolved—and will continue to evolve—to account for human strengths and weaknesses of interacting with technology and underlying data. From new visualization tools to new product designs and data collection methods, actuaries already are utilizing HCI insights and can further benefit by being cognizant of these interplays.

to the short-term rental market. Here at Voya, we recently leveraged artificial intelligence (AI) technology to help customers with visual impairments verbally navigate through their accounts.

Driving the Future of Our Interactions

While some companies have stepped up to try to meet the expectations technological innovation has created, the insurance industry still has plenty of opportunity to utilize HCI and BE concepts when thinking about everything from distribution to pricing and product features. The products are often still complex, siloed, illiquid and not easy to value or purchase. Websites such as Mint and Wealthfront are able to integrate real-time estimations on portfolios, homes and cars, but they are unable to put together a rough estimate on a life insurance policy. We are able to purchase and sell \$25 of someone’s debt through LendingClub or Prosper, but we are unable to purchase \$25 increments of life insurance as easily. Robo-advisors can display investment projections of funds and the fees associated, but they are unable to layer in annuities. In the near future, we will surely see attempts to solve these shortcomings; actuaries need to decide if insurance companies will be the ones providing these solutions.

Autonomous driving, peer marketplaces, crowd sourcing, AI, cryptocurrencies, virtual reality, robo-advisers and countless other emerging technologies will have consequences for the insurance industry. Each of these technologies will also allow for a different form of HCI, whether it is an internal analytical tool or an avenue for sales. Actuaries need to decide how much of this interaction will be consciously interpreted, or if the industry will continue to be pulled along in order to survive. ■

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Meet Alice and Bob

Using personas to make technology like cryptocurrency and blockchain relatable

BY KERRI LEMOIE



It's not uncommon to see explanations of the cryptocurrency Bitcoin or tutorials about blockchain featuring characters named Alice and Bob. Why Alice and Bob? What is the significance of those names in particular? These characters go back to the early crypto technology days of the 1970s, when they were used to explain scenarios of public key cryptography—also a critical aspect of cryptocurrency and its underlying technology, blockchain. Alice and Bob are not considerably developed characters, but over the years, the convention of using these names has become an effective narrative device.

Decoding Alice and Bob

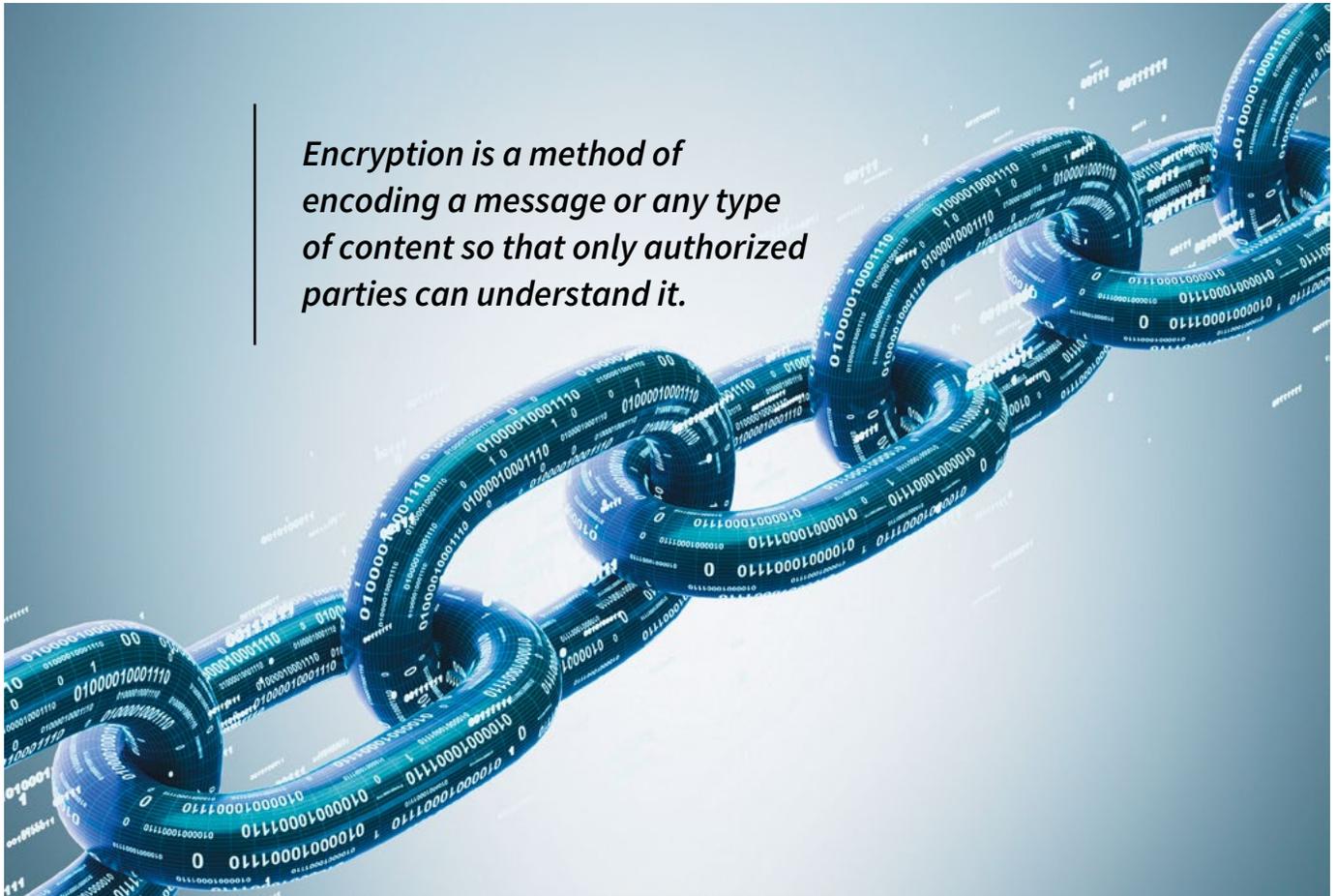
In 1978, Alice and Bob were introduced in the paper “A Method for Obtaining Digital Signatures and Public-key Cryptosystems,” which described a way to encrypt and authenticate data. The authors explained public key encryption and assigned the placeholder names, Alice and Bob, to machines “A” and “B.”¹ They didn't have any notable personality traits—they were simply intended to be anthropomorphic representations of machines.

Encryption is a method of encoding a message or any type of content so that only authorized parties can understand it. With public key cryptography, the content is encrypted using what is called a public key, which is comprised of a unique combination of





Using Alice and Bob to explain public key cryptography establishes characters who play roles in a narrative that make this challenging subject easier to understand.



Encryption is a method of encoding a message or any type of content so that only authorized parties can understand it.



It is estimated that nearly 4 million Bitcoins are considered lost.

an alphanumeric set of characters. Every public key has a unique mathematically associated private key, which is also a unique alphanumeric set of characters. Just as their names imply, the public key can be public, but the private key is intended to be kept private. The only way content encrypted with a public key may be accessed is by decrypting it with its private key.

As the internet has evolved, the potential for data vulnerabilities has increased, and it has become even more vital to secure data. Public key cryptography has become a common security standard used for encryption and identity verification. Encryption is used to obfuscate credit cards stored on databases. Data transferred over HTTPS is encrypted so it may travel from one location to another without being understood or stolen by

anyone in between. Bitcoin and other cryptocurrencies use public key cryptography as part of their coin exchange and to prove ownership.

Using Alice and Bob to explain public key cryptography establishes characters who play roles in a narrative that make this challenging subject easier to understand. For instance, a common narrative explains that Alice would like to send a secret message to Bob. She uses Bob's public key to encrypt her message and then sends it to him. Bob can read the secret message because he can use his private key to decrypt it. No one else can read Alice's message because they don't have Bob's private key.

Over the years, technology communities have had their fun with Alice and Bob. Jokes, songs and memes have been created to foster what has become an industry inside joke. Alice and Bob weren't alone

in their secret universe for very long. A cast of characters has joined them, including Eve, an eavesdropper trying to peek into secret discussions, and Mallory, the malicious actor who tries to interject or delete messages.² As each of these characters has been introduced, the use of first letter initials in relation to their intent has become an integral part of the nomenclature of crypto discussions.

Alice and Bob Meet Bitcoin

As Bitcoin has gained traction, Alice and Bob have become even more popular. Cryptocurrency, which was initially favorable to the libertarian technology types, started attracting the attention of the broader public—especially the curious, early-adopting investors. Because critical aspects of cryptocurrency and its foundational technology architecture (blockchain) use public key cryptography, an understanding of why that is and how it works is arguably required knowledge for the crypto-coin speculators. A lack of clarity on the necessity of public and private keys in cryptocurrency puts investments at real risk.

Bitcoin, the first cryptocurrency, was introduced in a white paper by Satoshi Nakamoto that explained a peer-to-peer payment system that didn't require banks.³ This system is considered "trustless" because no one involved needs to know and trust one another for it to function. A core element of the system is public key cryptography, which is used to prove control of coins. It is also used to populate the ledger, also referred to as the blockchain, the permanently recorded history of each transaction that keeps the system faithful.

The blockchain ledger lists every transaction since the beginning of that blockchain. Each transaction record contains a transaction ID, the amount, optional descriptive content and the public keys involved. There are no names or directly identifiable information, although public keys can sometimes be traced to identities.

Ownership of cryptocurrency is a loose concept and refers to the control of the private key associated with the public key that purchased or earned the coins. Coins are digital assets that are stored in software or hardware components called wallets. More than merely storage devices, wallets are often limited to particular coins, calculate current worth and are associated with the public and private key of the entity that controls the assets.

If the private key associated with one's coins is lost, the coins are inaccessible in the wallet. Like any other type of digital asset or file, private keys can be misplaced and accidentally deleted. Computer hard drives can fail, and computers can be stolen and hacked. Private keys cannot be replaced. It is estimated that nearly 4 million Bitcoins

are considered lost.⁴ During a recent Bitcoin boom in late 2017 into early 2018, it was dreadfully revealed that many lost millions in potential dollars because they lost their private keys.

Because of the boom and the desire to learn more about understanding and protecting private keys, Alice and Bob started appearing in more explanations and tutorials that targeted nontechnical folks who, unlike the crypto community, had no idea what these names meant and why they were seeing them nearly every time a crypto coin was mentioned.

Tutorials about Bitcoin featuring Alice and Bob are similarly structured like this: Alice would like to buy pizza from Bob that costs 0.004 BTC (Bitcoin), which at the time of this writing is approximately US\$15. Alice doesn't know Bob, but she does know his public key. She enters a transaction request on a Bitcoin exchange for 0.004 BTC and enters Bob's public key. The transaction is processed, and once it is verified that Alice has enough BTC to pay Bob, it is complete. The BTC is transferred from Alice's wallet to Bob's wallet by assigning the coins to Bob's public key instead of Alice's. The transaction is logged on the ledger and distributed throughout the system. Because Bob has the private key associated with the public key that now has the Bitcoins, Bob now controls the BTC instead of Alice.

This story serves as an example of an introduction to purchasing with Bitcoin. The narrative excludes the roles of the miners, how blocks are created, why the ledger is distributed or even what cryptography is, but it does contain the necessary information that explains how the Bitcoins are related to the public and private keys. Using Alice and Bob to tell the story humanizes the technology and makes it relatable.

Narrative Psychology

Storytelling is the oldest form of education and a natural way for humans to teach and learn.⁵ From a cognitive perspective, the human brain has evolved to learn and make meaning through narratives.⁶ We learn from stories, are entertained by them, and use them to make sense of our daily existence and as part of our decision-making processes.

A good story will engage receivers, convey meaning, be remembered and self-propagate.⁷ Part of why this is true is that good stories fit within a realm of meaning that we are able to understand. As psychologist Donald Polkinghorne notes, "Narrative meaning is a cognitive process that organizes human experiences into temporally meaningful episodes."⁸ For the brain to sort and remember, it is

BLOCKCHAIN: AN EMERGING TECHNOLOGY PERFECT FOR EMERGING ECONOMIES

The price movement of Bitcoin and Ethereum last year propelled blockchain, the underlying technology of all crypto-assets, into mainstream consciousness. Yet as the overvaluation of cryptocurrencies undergoes a major (and much needed) correction, it remains important to understand the implications of distributed ledger/blockchain technology.

We see tremendous potential for blockchain in emerging economies. Financial services and insurance in the United States are sophisticated and offer adequate comfort, convenience and safety measures to service and protect retail consumers.¹ This trust in centralized parties, however, is not a universal reality. Thus, in emerging economies, the institutional trust required for the provisioning of financial services and the breadth of coverage of newly growing economies can benefit from decentralized technologies.

Blockchain is a “trustless” ledger technology that minimizes central authority control. It enables peer-to-peer transactions with minimized need for costly “trusted” third-party assurance, bookkeeping or facility. Blockchains also provide an immutable history of transactions, which can be leveraged as a bona fide identity for individuals and families without access to traditional, state-sanctioned identities. In this way, blockchain protects against the failure of centralized institutions (relevant in many emerging markets experiencing hyperinflation or broken financial sectors) and enables services for demographics that are often left out of the traditional financial sector due to identity and credit barriers (some 1.7 billion adults across the world).^{2,3,4}

At Dunya Labs, we are excited to be working on bringing decentralized technologies to the emerging Indian market. These India-specific demographic factors indicate it is ripe for blockchain adoption:

- » A young population, with more than 50 percent under the age of 25⁵
- » One of the world’s largest smartphone populations, growing 30 percent year-over-year⁶
- » A price-sensitive market, which would respond to reduced costs⁷

As this previously untapped, unbanked and young market expands, blockchain technology can help pave the way for industries to leverage benefits inherent to distributed ledgers such as enhanced data security, decreased intermediary costs, seamless cross-border transactions, lower identity/credit barriers and diminished need for trust in centralized parties. In the insurance industry, companies have begun to pursue initiatives targeting enhanced fraud detection and risk prevention, new products intertwined with medical records stored with universal identities, and “smart contract” guarantees/escrows.⁸

If we draw comparison to early days of the internet, no one could have possibly imagined the primacy of online delivery over brick-and-mortar stores. This is the potential of blockchain—the potential to disrupt and create entirely new and innovative business models.

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ABOUT THE WRITER

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For the brain to sort and remember, it is theorized that we organize thoughts and experiences into schemas that then may become semantic memories containing factual knowledge, general knowledge and language.

Blockchain, as Marshall McLuhan would agree, is more important as a technology than the cryptocurrency it supports. It can improve data and processes for many insurance applications, including actuarial analyses. Actuaries can employ Alice and Bob as characters to help explain the complexity of their models.

theorized that we organize thoughts and experiences into schemas that then may become semantic memories containing factual knowledge, general knowledge and language. The new thoughts and experiences that relate to stored thoughts and experiences will have more meaning and therefore a better chance of being retained.

Narratives can help make sense of the unknown. Stories that are well-structured, relatable and engaging can help receivers understand and learn. Technology, which can be intimidating to many, may be easier to grasp if the narrative is more relatable. It can be compared to the usefulness of skeuomorphism in user experience. For example, word processing software was successful early on because it looked like a typewriter. A trash can on a computer's desktop is also a skeuomorphism—it resembles a trash can, is named that, and functions similarly enough that people know to use it. A cryptocurrency wallet is also a skeuomorphic element that allows people to relate their common understandings to a new one. Effective narratives about technology do this as well.

Alice and Bob narratives about public key cryptography and cryptocurrency can be effective educational tools. Using the same character-based framework fortifies an understanding through repetition and adds a dimension of meaning that goes beyond simple instructions or explanations. Alice and Bob—and even Eve, Mallory and the growing list of crypto characters—have become narrative tropes. Tropes add unexpected meanings to words and phrases such as metaphors and puns. Tropes are memorable advertising and propaganda tools because they are often entertaining with underlying meaning. Toncar and Munch note, “Presenting arguments as tropes may not only successfully deliver the argument, but may also elicit a favorable affective response as well.”⁹

Additionally, research suggests that positivity contributes to persuasion.¹⁰

Alice and Bob were not intentionally created to be persuasive or memorable elements. They were simple mechanisms used to illustrate scenarios of cryptography systems that can have complex patterns and implementations. Cryptocurrencies and blockchain are nascent and not widely understood. Using narrative elements like Alice and Bob facilitates understanding and may spur adoption and continued innovation. ■

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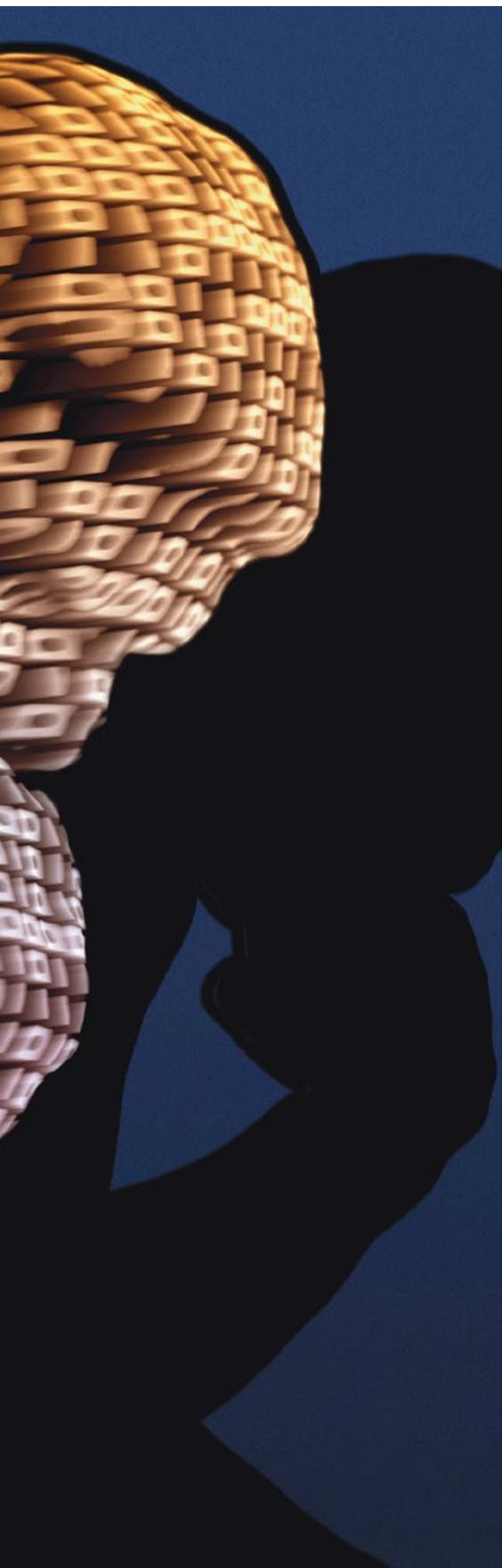
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Thinking Deeper

Big data and the
psychology of behavior
and cognition

BY REGINA M. TUMA



In 2008, Chris Anderson made a bold proclamation about the end of theory. His article in *Wired*¹ magazine signaled the end of our existing relationship with science and knowledge as we know it: theory, conjecture, hypothesis testing and sampling. Instead, infinite petabytes in puffy data clouds offer not a caricature but unmediated access to reality itself. Powerful correlations and massive data sets too complex for human imagination make cause and effect irrelevant. What matters is what people do—not the meaning of what they do, nor the meaning attached to self-other behavior.

The application of big data has grown, leaving little in personal and professional lives untouched, including employment decisions, personal credit worthiness and insurance rates.^{2,3,4} Society now relies on predictive policing and sentencing; education is increasingly data-driven; and municipalities deploy “smart city” initiatives based on data. Micro-marketing tactics bleed into electoral politics.^{5,6} And all of this is backed by the logic of lucrative data markets and an algorithmic decision industry that, as of 2016, was expected to grow more than \$2 trillion over the next 10 years.⁷

What Anderson announced to the world was the coming age of big data,⁸ not just as one method among many, but as *the* method and measure of all knowledge. As a psychologist, this sounded familiar as it took me to 1913 and John Watson’s bold manifesto for psychology, “Psychology as the Behaviorist Views It.”⁹ Psychology, according to Watson, would no longer be concerned with fuzzy psychological states that are not measurable. The data points for psychology would be behavior—what people do—publicly observable and countable. Psychology would now be a science concerned with the prediction and control of behavior.

Psychology’s version of big data and prediction came early, bringing this modern psychology into the fold of an artistically creative and increasingly urban modern society.¹⁰ Like big data, behaviorism had a practical focus on real world issues. By the time behaviorism evolved into B.F. Skinner’s *Walden Two*,¹¹ there was a clear utopian vision attached to it, much like the utopic tones attached to digital technology and the creation of a better world.^{12,13} Like data scientists, behaviorists conceptualized the mind as a black box.¹⁴ Behaviorism was also riding the technology boom of its day, in a society that saw the development of the airplane, Ford’s automobile and Edison’s grid while sharing great faith in inventors and industrialists.¹⁵ Skinner was known for wanting to create a “technology of the mind” and was referred to as a “machine psychologist,”

having created the baby crib and the learning machine as technologies of positive reinforcement.^{16,17,18}

The Transition Away From Stimulus-Response

The behaviorist model was built on the contingency between stimulus and response. The old “mentalist” psychology had been based on a more or less scientific study of consciousness that assumed access to the contents of the mind. This mentalism includes cognitive processes like memory, perception and motivational factors. It also extends to social psychological constructs like representations, attitudes, attributions and notions of self. These organismic variables mediate input and output. For example, Gestalt psychologists (the main challengers to behavioral theory) were very successful in demonstrating the work of cognition in perception—that simple, physical stimuli (light energy on receptor cells on the retina) are transformed into organized (complex) perceptions, which implied the work of cognition.¹⁹ For behaviorists, science could not be based on hypothesized unobservable cognitive constructs, but it could be based on observable facts (behavior) through the contingency of an observable stimulus and an observable response. As psychologist John Mills explains, “The only real data were those that could be observed.”²⁰ Again, this could easily be a statement about big data, where the behavior of interest becomes a series of countable digital traces in the form of online clicks and searches.

What is important, however, is the trajectory of what happened in between Watson’s declaration and Skinner’s unrepentant behaviorism: the resurgence of intervening cognitive variables, mental maps and latent learning. This necessitated a movement away from stimulus-response (S-R) to a stimulus-organism-response (S-O-R) model known as neo-behaviorism. Neo-behaviorists like Hull were responding to the Gestalt

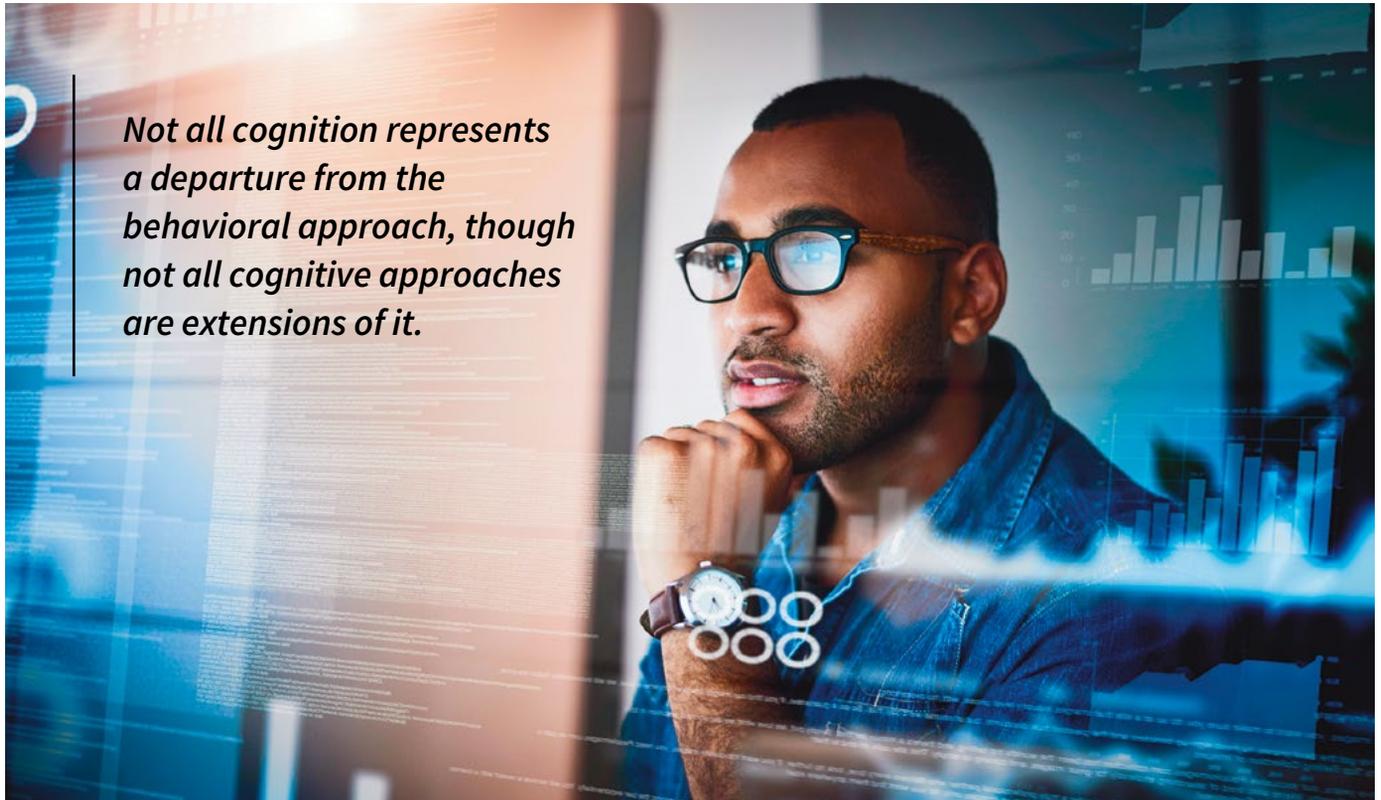
challenge on perception. Hull tried to operationalize cognitive variables through quantification and abstract language: drives, fear, incentives and frustration.²¹ Meanwhile, Tolman’s behaviorism was pointing to the role of learning without contingency to rewards and pointing to cognitive variables in the form of cognitive maps.²² Stimulus selectivity, (devaluation or preference for a particular stimulus) undermined the neutrality of the input variable, pointing to the role of motivation in determining the contingency be S-R relationships.²³

Only Skinner remained unrepentant with his brand of radical behaviorism, and that is because his behaviorism accounted for the experiential quality of mental life even as he redefined these experiences as physical events. For Skinner, the experience of consciousness was not metaphysical but an objective (though internal and private) bodily event. According to Mills,²⁴ Skinner seamlessly bridged the divide between cognitive states and behavior, though eventually he, too, would be challenged for the inadequacy of his theory of language and the hidden ghost-like specter of intentionality lurking within his approach.^{25,26}

It is important to recognize that the study of cognition represents different approaches that emphasize the role of cognitive factors in shaping how we process information and make sense of self, others and events. New technology made it possible for psychologists to more directly measure what Watson and others had deemed “fuzzy mental states.” Computers provided a model of the human mind as an information processor. Not all cognition represents a departure from the behavioral approach, though not all cognitive approaches are extensions of it. Experimental approaches to cognition, in contrast to more qualitative approaches, adhere to methodological behaviorism and are co-extensions of neo-behavioral models that preserve a mediating role for cognitive variables.²⁷ The difference,



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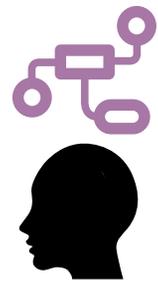
however, is that cognitive approaches explicate the cognitive malleability of the stimulus as it is filtered, processed and cognitively redefined. Behavior could be due to this psychological redefinition of the stimulus.²⁸ An early example can be seen in Bruner's study,^{29,30} which shows that poor children overestimate the size of coins compared to rich children in the study. Objectively, the input (stimulus) is the same, but when filtered through affect, needs and social economic status, there is a different outcome.

Big Data Meets Cognition

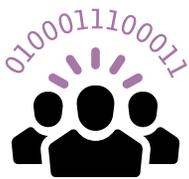
There are two ways in which cognition becomes relevant for big data. The first refers to unconscious cognitive processes that shape inferences and judgments. Kahneman and Tversky's³¹ influential work *On the Psychology of Prediction* explores psychological shortcuts or mini algorithms that lead to less-than-optimal results in gathering information and

making judgments.³² This work is part of a broader literature on social inference that includes everything from attribution theory, how memory shapes raw data in human reasoning to less-than-optimal information-gathering strategies. This automaticity of thought has been extended to unconscious biases that are similarly employed with detrimental effects in social inference.³³

There is emerging literature documenting the differential effects and impacts of big data algorithms that recreate biases in society: Google searches and the association of African-American names with ads for criminal search records,³⁴ proprietary algorithms and algorithmic redlining,³⁵ predictive policing and increased surveillance of minority communities,³⁶ and bias in facial recognition algorithms.³⁷ While there is industry hope that "objectivity" can be written into the code, the industry must remain open to understanding how unconscious cognitive biases can shape



Unconscious cognitive biases can shape and influence the harvesting, selection and management of databases.



As big data spreads, it enters into relational dynamics with individuals and communities on the receiving end of data-driven decisions and policy outcomes.

and influence the harvesting, selection and management of databases, and how these cognitive variables translate into human efforts to create algorithms. In other words, the data industry must be open to making the transition from *thinking fast* to *thinking slow*.³⁸

Not all cognitive variables are unconscious and automatic. There is established research on metacognitive factors, which include executive control, reflection and awareness.³⁹ And there is now higher-order awareness in society about the role and impact of technology. This includes concerns over privacy and algorithmic overreach, as well as concerns over the role of technology firms in private life and the reshaping of public culture.⁴⁰

Moments of awareness have consequences.^{41,42} Until recently, it was difficult for individuals to understand the mediating role of algorithms in their lives and interactions. However, articles like “If You Are Not Paranoid, You Are Crazy”⁴³ in *The Atlantic* bring home the reality that our gadgets are indeed watching and listening. Recent U.S. House and Senate hearings on the role of social media giants in the 2016 election also serve to alert the public to the extent to which social

media companies watch, track and target users.⁴⁴ Becoming aware of increased surveillance can prompt reactance and subversion,⁴⁵ especially when perceived as a loss of freedom or privacy. This can lead to attempts to subvert the algorithm by creating subaltern modes of exchanges on social media that avoid algorithmic detection—sub-tweeting, screen capture and hate-linking through images instead of links.⁴⁶ Knowledge of widespread surveillance tempers willingness to express political opinions.⁴⁷ Pervasive “dataveillance” threatens to turn lives into extended data collection labs, prompting demand characteristics inherent in the social psychology of the experiment in the form of the good subject syndrome or social desirability.^{48,49} All of this can affect the integrity of any data collected.

It is important to emphasize that as big data spreads, it enters into relational dynamics with individuals and communities on the receiving end of data-driven decisions and policy outcomes. Yet to be explored are social cultural factors like stereotype threat⁵⁰ that can be triggered as a result of increased surveillance in minority communities—or even in terms of the over-testing of minority children

through data-driven education policies. When triggered, stereotype threat becomes a self-fulfilling prophecy in terms of the behavior elicited.

The Way Forward

Just as it is important not to caricature behaviorism, it is important to not dismiss big data methods. Big data is an important technology and method of knowledge creation. It is important to bring large numbers into the fold of social science concepts.⁵¹ At the same time, there is an inherent duality to big data. It can be imposed top-down on communities, or it can be used from the ground up—big numbers in the hands of communities can confer visibility where none or little existed.⁵² Organizations and civil action groups are increasingly becoming aware of both the value and limitations inherent in big data. For example, the group Data for Black Lives recognizes the power of data to “empower communities of color,” while at the same time critiquing the use of data as an “instrument of oppression, reinforcing inequality and perpetuating injustice.” As the group states, “Today, discrimination is a high-tech enterprise.”⁵³

The parable for big data, as it was for behaviorism, is that in the chain of human events, there is lots of room for complexity between stimulus and response—and in terms of input and output of data. The complexity of cognition will also extend to social dynamics as relational spaces that shape the relationship between big data, cognition and communities. It will be important to welcome big data into this future. ■

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For the complete list of references, please visit TheActuaryMagazine.org/Thinking-Deeper.

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John Watson not only introduced behaviors as data points, he led the development of a science of measurement referred to as “Mensuration” to quantify experimental results. For this reason, John Watson is regarded by some as the first data scientist.

GENETICS AND EPIGENETICS IN HEALTH AND LIFE INSURANCE

There are many genetic tests available today that can provide information on heredity and susceptibility to diseases. It is important to note that virtually all diseases have an environmental component to them. This means that just because one is more susceptible to a disease doesn't mean they will get it, and if one is not susceptible to a disease, it doesn't mean they won't get it. Results can also provide information on medications. This is important for the insurance industry because if a drug works for a disease to which the individual is more susceptible, we should be less concerned. However, if a drug doesn't work for a disease to which the individual is more susceptible, there might be more concern. Here, “works” means the person metabolizes the drug more quickly. For quick metabolizers, less than the normal dosage is likely needed. If the person can't metabolize the drug, treatment can move immediately to another drug, without wasting time on one that doesn't work.

In the United States, genetic testing is not allowed for health insurance underwriting, but it is not prohibited for life insurance underwriting. While many are afraid that insurance companies will use genetic information about an individual against them if they have access to it, I suggest the opposite is true—that insurance companies can help insureds with this information. As mentioned, a genetic test tells the diseases to which one is more or less susceptible. Health insurers want insureds to stay healthy, and life insurers want insureds to live longer. Therefore, as an industry, post-issue genetic tests can be used by the company to inform insureds how to extend healthy longevity, which is a win-win for everyone.

While genes never change, epigenetics changes over time based on one's actions. Epigenetics is a methylation process that indicates gene expression. It provides the current state of genes and is driven by behaviors such as diet, exercise, smoking and medications. This too can be used to improve health and longevity.

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Never Give In

Q&A With Simpa Baiye, FSA, MAAA, CFA, director at PwC

What drew you to the actuarial profession?

I have a somewhat atypical story: As a 10-year-old boy living in Lagos, I was convinced that I wanted to become a pilot and an aeronautical engineer. Fast-forward to age 13 while attending a private American school in Dakar, Senegal, and my Ghanaian private math tutor suggested I consider the actuarial profession. He thought my flair for business and my quantitative skills would be a good match. I still did not fully appreciate the meaning of the word “actuary,” so I went to a nearby library to do more research on the profession. I also wrote to the Institute of Actuaries in England and received a brochure that gave me a lot more information. What appealed to me most was the ability to combine probability and statistics in solving complex financial problems within a business setting. After a few more conversations with my parents, I made my decision. Here I am today.

Can you describe a successful day?

A successful day for me is one in which I provide and communicate valuable insights to my clients. In my current role as a consulting actuary, I often advise clients in the U.S. life insurance industry on the financial risks and rewards of their acquisition targets, product plans or investment strategies. I cannot overstate how pleased I am when my clients understand the complexities of the businesses they are looking at and come away with the confidence to make a decision. A successful day also ends with me making a difference in my family and/or my community.

What do you learn from the people with whom you work?

I have come to appreciate a variety of styles and work habits. My colleagues are all very successful and motivated, but they approach business issues in different yet equally effective ways. Bringing this “cognitive” and “procedural” diversity together greatly enhances the value our team brings to our clients.



Simpa Baiye can be reached at simpa.baiye@pwc.com.

Who inspires you?

People who never give up in the face of tremendous adversity and setbacks inspire me. Historical figures such as Abraham Lincoln and Olaudah Equiano. Contemporaries such as the Australian motivational speaker Nick Vujicic also come to mind. They do not sugarcoat their circumstances, but choose to look—with realism—toward a better day. They resolve to live and grow in spite of their circumstances.

Are there any words of wisdom you'd like to share with up-and-coming actuaries?

Stay aware of the changes in the industry. Take the time to learn from your successes and setbacks. Keep upgrading your communications skills. You own the long sprint

that is your career. Cultivate a personal “board of directors” made up of diverse mentors. And in the words of Winston Churchill: “Never give in, never give in, never, never, never—in nothing, great or small, large or petty—never give in except to convictions of honor and good sense.”

What is your best advice for staying ahead of the competition?

Keep learning about the ever-changing world of finance and insurance. Look to adjacent industries for insights that are applicable to yours. Invest personal time in educating yourself early on changes in the regulatory environment and technology that could affect your clients and industry. ■

What appealed to me most about the actuarial profession was the ability to combine probability and statistics in solving complex financial problems within a business setting.

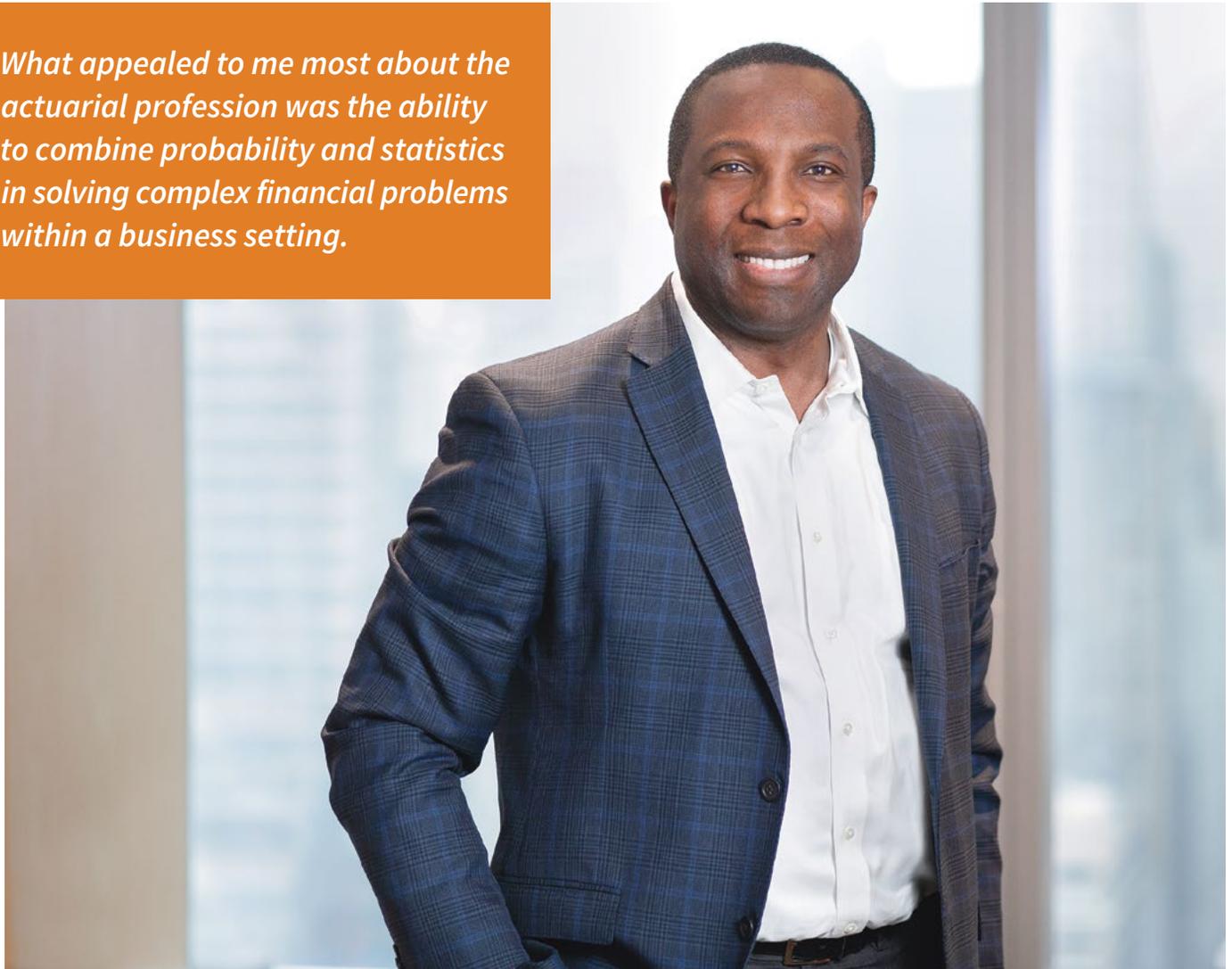


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Working to Move the Needle

BY SARA TEPPEMA

In the February/March 2019 issue of *The Actuary*, Ying Zhao, FSA, MAAA, interviewed Craig Reynolds, FSA, MAAA, about his (and others') efforts to raise diversity and inclusion (D&I) to an issue of importance and urgency for the Society of Actuaries (SOA). The SOA laid a strong foundation by including D&I in the current Strategic Plan and explicitly calling out D&I as one of the key strategies for Insight & Influence. The SOA's D&I statement is:

The Society of Actuaries (SOA) best fulfills its mission when it is diverse and inclusive of all individuals. Openness to and acceptance of diverse perspectives, cultures and backgrounds helps to attract the best talent and ensures the overall inclusivity of the actuarial profession.

The SOA welcomes the membership and participation of all individuals, regardless of race, ethnicity, religion, age, gender, sexual orientation, gender identity or expression, disability, or national origin.

I had been watching all of this work from the sidelines when I was elected to the SOA Board last fall, so I was thrilled to accept the SOA president's offer to chair the SOA's Inclusion and Diversity Committee (IDC). It is a huge honor, and I do not take this responsibility lightly.

During the past few months, I've been working with SOA staff and volunteer leaders to understand the infrastructure supporting D&I (committees, organizations, funding mechanisms, etc.) within the actuarial profession. So far, I've met with people from other actuarial

Giving everyone a seat at the table is a great start. To optimize the benefits of diversity, we need to ensure all of the voices around the table are heard and can have a real discourse about the future of the profession.

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organizations focused on D&I, including the Casualty Actuarial Society (CAS), the International Association of Black Actuaries (IABA) and the Organization for Latino Actuaries (OLA). I attended LGBTQ and Ally receptions at the SOA Health Meeting and the SOA Annual Meeting & Exhibit (watch for these receptions at all of our major meetings!), and I have met with folks from my own company to learn more about how we are working to create a more diverse actuarial profession. The level of positive and progressive energy is truly inspiring and will guide the SOA's work as we continue to collaborate and work toward our collective D&I goals.

Speaking of goals, an important activity in 2019 and beyond will be increasing awareness of the actuarial profession for African-American and Hispanic students.

Some background: In 2017, the SOA, CAS, IABA and The Actuarial Foundation collaborated to field a market research study to understand why African-American and Hispanic students were underrepresented in the profession. The study identified existing barriers throughout the actuarial career pipeline. *Lack of awareness* ranked as a primary barrier to students considering the profession as they make decisions about undergraduate programs.

This market research resulted in the SOA forming the Awareness Task Force with collaborating organizations, employers and others. They were tasked with evaluating marketing and communication efforts to raise awareness of the actuarial profession among U.S. students, their parents, teachers, counselors and other influencers.

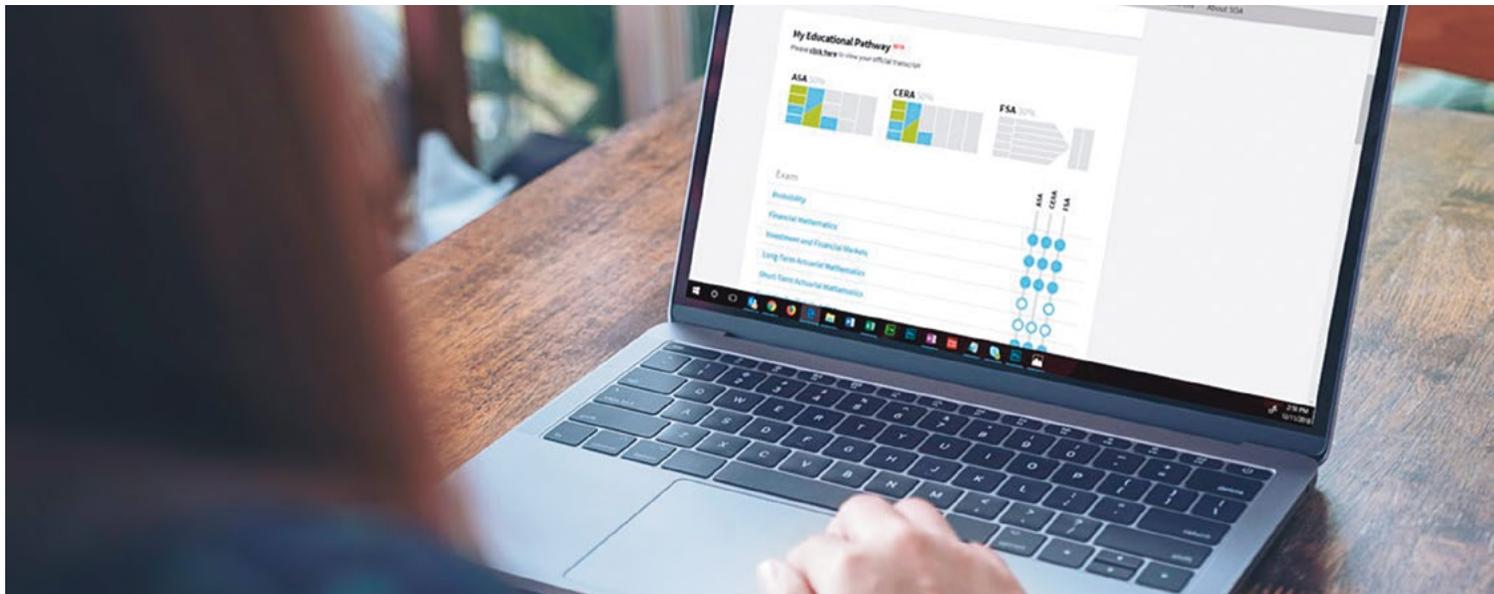
The task force learned the power of digital marketing and how creating a funnel of conversion points (from watching a video to engaging a mentor or attending a High School Actuarial Day) toward the goal of registering for an exam can change the future of the profession and encourage a new generation of actuaries.

In addition to continued collaboration and evaluation of the awareness issue and increasing the number of our members who complete their enhanced demographic profile, the IDC will be busy looking for ways the SOA can be more inclusive. Giving everyone a seat at the table is a great start. To optimize the benefits of diversity, we need to ensure all voices around the table are heard and can have a real discourse about the future of the profession.

I am so excited to continue to build on the solid foundation of D&I that has been established in recent years. I look forward to an ongoing discussion, and welcome all comments, feedback and dialogue on inclusion, diversity or any other topic. ■

ABOUT THE WRITER

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Track Your Progress Toward an SOA Designation

BY CHRISTIE BALISTRERI AND BRETT ROGERS

In 2015, the Society of Actuaries (SOA) introduced a new online experience for members and candidates when it launched My SOA. This tool offers a centralized place to view orders, access eLearning and professional development products, and view volunteer engagement. The launch of My SOA was a significant step forward in bringing a more personalized experience for candidates and members on *SOA.org*.

With the goals of expanding personalization for users on *SOA.org* and creating tools to help candidates and members, the SOA launched My SOA Educational Pathway in October 2018. The journey to obtain an SOA designation requires many hours of study and rigorous examination. The My SOA Educational Pathway is designed to make it easier for candidates to track their progress by displaying a graphical roadmap of the requirements needed to obtain a designation. As candidates continue along the pathway to membership, this tool serves as a centralized place to view requirements needed/completed and access resources.

My SOA Educational Pathway Features View Progress Toward a Designation

Once logged in to My SOA, users can view the requirements needed to obtain

ASA, CERA and FSA in one centralized location. As a user completes requirements, they are shown as being fulfilled. Users can also view the percentage of requirements completed for each of the designations.

Please note: The Educational Pathway is available to pre-FSA candidates who have completed their first requirement on or after July 1, 2013.

Access Relevant Resources

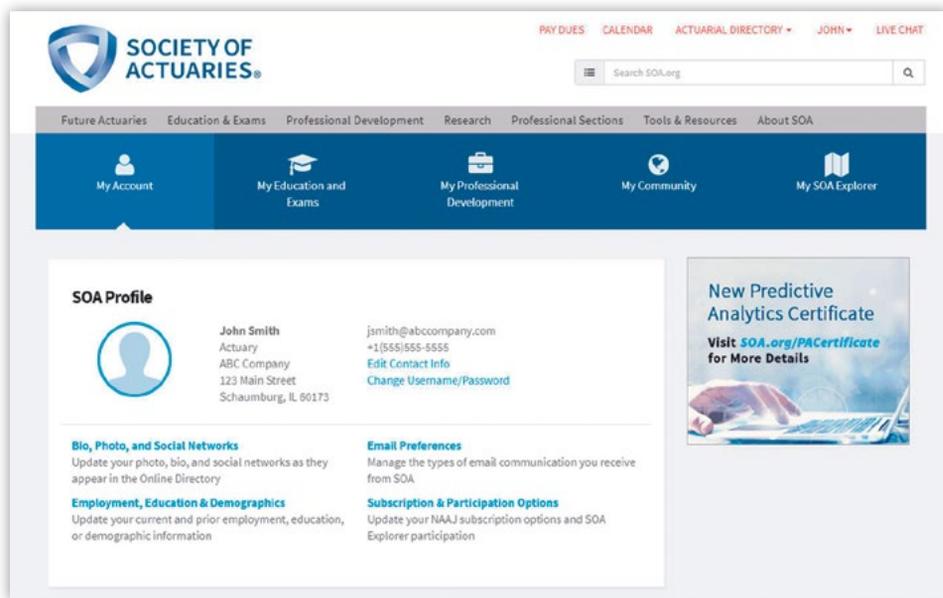
Users will have access to the detailed requirements pages for each component, which provide a more streamlined way to take next steps, such as exploring additional information on requirements and registering for exams. Users can also access their personal SOA transcript, which is the official record of requirements completed.

SOA EDUCATIONAL PATHWAYS

The SOA launched a new design to help candidates understand and familiarize themselves with the SOA educational pathways.

The new design resembles a tangram and uses a series of shapes and colors to represent the different types of requirements needed to obtain an SOA designation/credential.

Start exploring at pathways.SOA.org.



RELATED LINKS

My SOA Educational Pathway Demo

bit.ly/Educational-Video

My SOA Educational Pathway

bit.ly/MySOA-Education

Explore FSA Tracks

Users can select any of the FSA specialty tracks to view the requirements needed. As candidates progress, requirements will be marked as complete and the percentage completed toward an FSA will be updated. Users can switch the view between tracks at any time. As a reminder, SOA rules mandate all requirements be met within a track; there is no mixing of requirements from various tracks.

View Current Curriculum

The My SOA Educational Pathway will always display the current curriculum, so users won't need to calculate equivalent requirements from past curricula. Informational icons will notify users when additional information is available on that specific requirement. Simply click the circle icon with the exclamation point to reveal important information.

Mobile Friendly

My SOA Educational Pathway is mobile friendly, so you can access it from any device, anywhere, as long as you have a My SOA account.

Dedication to Creating Tools to Help Candidates and Members

The SOA is dedicated to creating tools and resources that help candidates and members. The SOA continues to support the needs of candidates and members by analyzing trends and analytics, developing new offerings and reviewing feedback from stakeholders.

The launch of My SOA Educational Pathway brings the SOA another step forward in offering a more personalized experience on *SOA.org*. The SOA will continue to look for opportunities to enhance the online experience for both candidates and members. ■

ABOUT THE WRITERS

CHRISTIE BALISTRERI, PMP, is project management specialist at the Society of Actuaries. She can be reached at cbalistreri@soa.org.

BRETT ROGERS is registrar and director of Exam Analysis at the Society of Actuaries. He can be reached at brogers@soa.org.

Emerging Risks and Climate

Q&A with R. Dale Hall and Ronora Stryker

Managing director of Research at the Society of Actuaries (SOA), R. Dale Hall, and senior practice research actuary at the SOA, Ronora Stryker, discuss emerging risks on the global horizon. The SOA develops and sponsors a variety of research projects and studies on subject matter related to risk management.

Can you tell us about the emerging risk survey?

Stryker: The SOA, the Canadian Institute of Actuaries (CIA) and the Casualty Actuarial Society (CAS) Joint Risk Management Section released the 12th in the annual series of emerging risk surveys. Authored by SOA member Max Rudolph, this survey tracks enterprise risk management (ERM) perspectives on emerging risks. We conducted this survey of more than 250 risk managers from North America, Europe, Asia, South America, Africa, Caribbean/Bermuda and the Middle East.

What are the top emerging risks?

Stryker: The top two emerging risks for 2018 are cyber and interconnectedness of infrastructure and climate change. This year's survey saw a large jump in the number of responses for climate change risk. The other emerging risks rounding out the top five list are technology, a demographic shift and financial volatility.

Hall: While we expected to see geopolitical issues high on this list, both terrorism and regional instability risks moved out of the top five in this survey. We know that is due in part to the increase in natural catastrophes lately, which is why climate change is ranked higher in this

survey. These findings help us understand what is front and center in the minds of risk managers in the United States, Canada and overseas.

The SOA, CIA and CAS host the 2019 ERM Symposium in early May with several sessions covering topics related to the different emerging risks, from climate change to cybersecurity. I'm glad we're able to provide this collection of research and thought leadership in this sector to help understand and manage these risks.

Stryker: During the past half-year, we released two other climate-related research reports. A jointly released report from the SOA, CIA and CAS on flood and catastrophe models focuses on how to harness the model results into pricing and underwriting. Another report focuses on the different types of flood risk, modeling approaches, measurement strategies and pricing.

There is also the quarterly analysis of severe weather in Canada and the United States through the Actuaries Climate Index. Over the past few years, the SOA, CIA, CAS and the American Academy of Actuaries have released findings on the frequency of extreme weather and the extent of sea level change. If you haven't already done so, check out the latest findings on the index website, as you can explore regional graphs and maps on climate trends in the regions.

Hall: As part of the SOA's strategic research programs, we will form a committee of volunteers later this year to help identify, cultivate and distribute a series of studies on climate trends and their impact on extreme and catastrophic events. Stay tuned for further developments.



Visit [SOA.org/Research](https://www.soa.org/Research) for the latest updates on new research opportunities, data requests, experience studies and completed research projects.

What other risk-focused studies have you released recently?

Hall: Aside from the collective weather-related research, the Joint Risk Management Section released a report examining policyholder behavior in the tail (PBITT). We developed this report to help create better estimates of PBITT and to provide guidance with policyholder assumptions in extreme scenarios. The report looks at pricing, reserving and risk management of minimum guarantees on variable annuity products.

RELATED LINKS

Risk Management Research

bit.ly/SOA-Risk

Flood Risk

bit.ly/SOA-Flood

Pricing and Underwriting With Catastrophe Models

bit.ly/Catastrophe-Model

Actuaries Climate Index

ActuariesClimateIndex.org

Policyholder Behavior in the Tail

bit.ly/Tail-Risk

Video: Low Growth Financial Risk Scenarios and Emerging Risks

bit.ly/SOA-Risk-Video

RESEARCH READS

Machine Learning

The SOA developed a literature analysis to better understand the different machine learning methods and how they can be used in insurance applications.

bit.ly/Machine-Learning-Methods

Financial Concerns in Retirement

As part of the SOA Strategic Research Program on aging and retirement, the SOA released reports on financial fragility and financial risk concerns in retirement, both of which compare different generations' perspectives.

bit.ly/Age-Retire

Health Cost Utilization

The SOA developed a summary analysis of the Health Care Cost Institute's report on health care cost and utilization. The report illustrates employer group commercial health care costs and trends from 2013–2017.

bit.ly/SOA-HCCI

ABOUT THE WRITERS

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RONORA STRYKER, ASA, MAAA, is senior practice research actuary at the Society of Actuaries. She can be reached at rstryker@soa.org.

BE DYNAMIC



Web Exclusive

Putting the ACA Back Together Again

“Putting the ACA Back Together Again” by Greg Fann, FSA, FCA, MAAA, concludes the web-exclusive series comprising the Strategic Initiative, “Commercial Health Care: What’s Next?” of the Society of Actuaries’ (SOA’s) Health Section Council. The initiative was established to proactively educate health actuaries and other interested parties on potential changes in Affordable Care Act (ACA) markets. Readers will learn more about premium subsidies, incentives and the interconnectivity of ACA policies.

bit.ly/ACA-Fann

bit.ly/Commercial-HC

Webcasts

Listen at No Charge

Tap into topics such as machine learning, leadership, ethics, Microsoft Excel, pet insurance and more. To listen to SOA webcast recordings at no charge:

- » Webcasts must be at least one year old.
- » You must be a member of the professional interest section that created the webcast to view it at no charge.

Go to SOA Engage. Log in using your SOA username and password. Go to “My Communities” and select the specific section. Webcasts that have not reached the one-year mark can be purchased for \$149 through the SOA.

engage.SOA.org

bit.ly/SOARRecordings

Videos

Dynamic Thinker

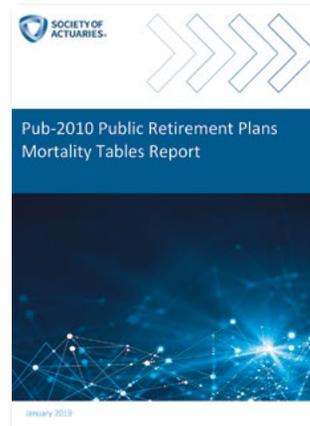
Over the course of his career, Syed Mehmud, ASA, FCA, MAAA, has leveraged his background in mathematics, physics and actuarial science to grow as a dynamic thinker. Learn how Mehmud strategically uses data and the power of predictive analytics to overcome challenges in Medicare and Medicaid.

bit.ly/SOA-Dynamic-Thinker

What are The Odds?

Richard Sweetman, FSA, MAAA, recently competed on *Who Wants to Be a Millionaire?* He discusses his probability of winning and his approach to decision-making on the show. Sweetman also notes the importance of understanding your audience to make your work findings relatable.

bit.ly/Next-Day-Millionaire



Report

Retirement Plans

The SOA's Retirement Plans Experience Committee released the final report of the Pub-2010 Public Retirement Plans Mortality Tables. This study provides a comprehensive review of recent mortality experience of public retirement plans in the United States.

bit.ly/Pub-2010



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Timeless

THE PAST, PRESENT AND FUTURE OF THE SOA

1889

In 1889, the total actuarial population in North America was between 80 and 100 people. The individuals featured here were connected to the actuarial profession during this time frame, but some were rarely known for their actuarial work.

Elizur Wright, a Yale graduate, made his name as a reformer—fighting first to abolish slavery, and then to make Massachusetts a leader in life insurance regulation. His first life insurance connections were with Massachusetts Hospital Life and New England Mutual. He also created actuarial tables to help insurance companies set premiums.

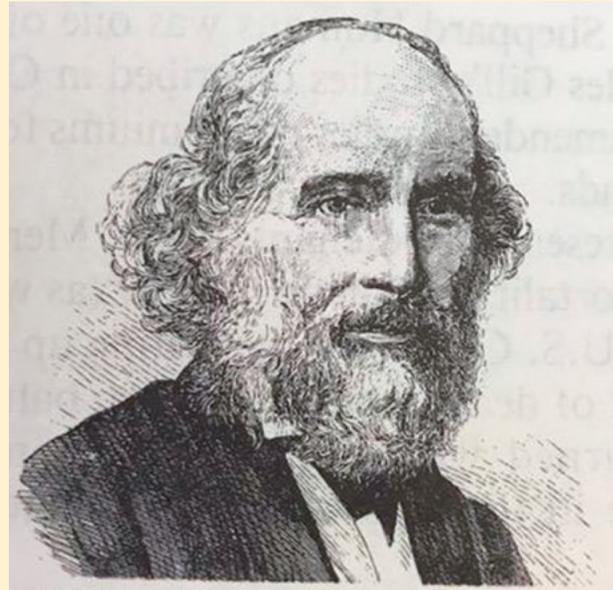
One member of Elizur Wright's large family, **Lucy Jane Wright**—unofficially noted as the first woman actuary—learned the actuarial craft during the eight years she worked as her father's assistant. In 1866, Union Mutual Life, then a Boston company, appointed Ms. Wright as its actuary. She mastered college-level mathematics by age 15. She worked at Union Mutual for seven months and passed away shortly after from tuberculosis.

One of the greatest bridge players, **Oswald Jacoby**, was also an expert at backgammon and a variety of card games. He worked as an actuary and was considered by many as a “human computer” for his amazing recall of numbers.

Sir Edmond Halley was largely known for his contributions to astronomy and calculating the orbit of the comet named after him (Halley's comet). He was also a mathematician and credited with developing one of the first life tables in 1693.

Charles Gill was an actuary for only six and a half years due to his untimely death at age 50. In April 1849, Mutual Benefit Life Insurance Company appointed him its mathematician, but he soon was hired by Mutual Life of New York for mortality studies and premium revision.

Considered to be one of the most influential authors in the 20th century, **Franz Kafka's** works include *The Metamorphosis*, *The Trial* and *The Castle*, to name a few. Kafka worked as an insurance executive during the day—handling claims as well as other business functions.



Elizur Wright helped make Massachusetts a leader in life insurance regulation. His daughter, Lucy Jane Wright, is unofficially noted as the first woman actuary.

Source

Moorhead, E.J. 1989. *Our Yesterdays: The History of the Actuarial Profession in North America, 1809–1979*. Schaumburg, Illinois: Society of Actuaries.

RELATED LINKS

SOA History

[SOA.org/about/soa-history](https://soa.org/about/soa-history)

Historical Background

[SOA.org/about/historical-background](https://soa.org/about/historical-background)

Be An Actuary

BeAnActuary.com

If you have any historical information that would be suitable for publication in TIMELESS, please email Jacque Kirkwood, staff editor, *The Actuary*, at jkirkwood@soa.org.

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- E-learning modules open on June 11 and in-person seminar takes place mid-Nov. in Chicago or New York City
- E-learning modules open on Nov. 19 and in-person seminar takes place mid to late April 2020 in Chicago or New York City



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