TECHCONNECT

ARIZONA'S TECHNOLOGY MAGAZINE

05 Chain Reaction

06 Powerful Peers

08 Return On Investment

BUSINESSES AREN'T THE ONLY THING WE SCALE

Something big, bold and exciting is happening in the Grand Canyon state. Cutting-edge companies are launching, testing and scaling new technologies in Arizona. Our culture of innovation, highly-skilled talent pool, lean regulatory environment and affordable operating costs provide the perfect platform for business growth and success. Beyond being a place where you can achieve your professional goals, Arizona also provides a lifestyle that allows you to achieve your personal goals. With year-round sunshine, endless outdoor activities and a positive outlook, we play as hard as we work. It's this perfect balance that makes life better here.

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TECH CONNECT

ARIZONA'S TECHNOLOGY MAGAZINE

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ARIZONA COMMERCE AUTHORITY

ARIZONA TECHNOLOGY COUNCIL
a place to connect and grow

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FinTech on a Fast Track

STEVEN G. ZYLSTRA

Fast growing. Disruptive. Promising.

All are fitting words to describe the Financial Technology community that is taking off, FinTech—the shorthand as this sector has come to be known—is showing there are plenty of opportunities to reshape the traditional ideas we've had toward finance.

For example, do you really need to physically take your check to the bank on payday any longer? Did you ever imagine you can make an insurance claim on your phone? These and other innovations stemmed from looking at the world of finance in a different way.

No doubt Gov. Doug Ducey and the Arizona Legislature recognized the potential that FinTech offered when they backed the ground-breaking regulatory sandbox allowing limited access to Arizona's market for testing innovative financial products or services without first obtaining full state licensure or other required authorization. They previously supported legislation that amended the Arizona Electronic Transactions Act to include digital signatures recorded on a blockchain.

If "sandbox" and "blockchain" are new terms for you, they won't be after reading this issue of TechConnect. As you'll learn inside, public policy efforts are very much part of helping bring about the success that FinTech is experiencing in Arizona. Of course, there are other examples of FinTech progress that we'll explore in these pages.

Besides telling you where the state has been, let me offer a few ideas on where we should be headed in the use of FinTech.

The Arizona Technology Council will continue its efforts to move the ball forward in FinTech as we turn to policymakers and government leaders for their support of both new ideas and ways of doing the state's business. For example, with blockchain in place, we encourage the Arizona Corporation Commission to work towards utilizing it for corporate records and filings by initiating trials and pilots to develop capabilities, gauge future direction, and, when appropriate, inaugurate full-scale initiatives. Commission members also should examine the potential to issue and trade securities on a blockchain platform.

Why stop there? Arizona's executive branch may want to consider using blockchain in managing and storing state government records for cost, efficiency and security considerations; initiating trials and pilots to develop capabilities; gauging future direction; and, when appropriate, inaugurating full-scale initiatives.

What other potential opportunities exist? What about money itself?

The Council has a goal of helping drive state regulatory reform to allow use of virtual currency that meets the needs of the FinTech sector where innovations primarily rely on virtual currency. By providing a streamlined supervisory experience for virtual currency and non-bank firms that is transparent, we would provide a level playing field for businesses that doesn't favor larger players over small ones, and appropriately protects consumers from harm.

The Council will work with other states and national organizations in establishing common multi-state money transmission licensing (MTL) and virtual money regulation and licensure that would ensure legal and regulatory reciprocity between participating jurisdictions.

As you can tell, we should explore getting the most bang for the buck when it comes to FinTech.

STEVEN G. ZYLSTRA is president and CEO of the Arizona Technology Council and Arizona Technology Council Foundation..

CHAIN REACTION

Arizona lawmaker gets colleagues to see value of FinTech

Rep. David Schweikert

While growing up, Rep. David Schweikert pictured his own destiny but it didn't quite include walking the halls of Congress as a member of the Arizona delegation. "My career counselor did not believe there was a way to make a living being a techno-utopian," he recalls. "So now, I try to influence policy with a hopeful and optimistic view of the future."

In fact, Schweikert is playing a key role in a fast-growing segment of financial technology that should impact the futures of many. He co-chairs the Congressional Blockchain Caucus, leading efforts to educate lawmakers on how blockchain can be implemented. "The caucus' goal is to educate both staff and members of Congress on the benefits of blockchain and the distributive ledger in policy making, and how this technology platform can create societal benefits," Schweikert says.

The time and mood appear to be right for such support from Capitol Hill. "I believe there is great optimism in Congress that the technology can provide a variety of opportunities including security and transparency for individuals and businesses," he says.

Part of the reason for the positivism stems from the results so far. "We are already seeing an impact on the world of FinTech, including a number of pilot programs from managing to the cost-efficient movement of value," Schweikert says. "Blockchain is transforming the banking industry with faster cross-border financial transactions and can help the unbanked population in ways the current system hasn't been able to."

To smooth the road that lies ahead, the industry already has an ongoing exchange occurring with lawmakers. **"**Much of our FinTech dialogue—which is almost every day—focuses on regulatory ambiguity and what policymakers can do to create a clearer path for the technology," he says.

Schweikert's effort in blockchain is among the reasons he was named winner of a 2019 CompTIA Tech Champion Award given to leaders focused on driving innovation, job growth and advancements for the information technology industry. Besides introducing bipartisan legislation to modernize tax laws for cryptocurrencies, he also has offered a measure to establish a 10-year plan that can accelerate the development of quantum information science and technology applications.

The Tech Champion Awards are given annually to a member of the House of Representatives, as well as a member of the Senate and an industry executive who has exemplified leadership in the technology sector. CompTIA, or the Computing Technology Industry Association, is the leading voice and advocate for the $1.5 trillion U.S. information technology ecosystem, and the more than 35 million industry and tech professionals who design, implement, manage, and safeguard the technology that powers the world's economy.

The congressman also has supported legislation promoting research for science, technology, engineering and math programs, and streamlining federal investments at the National Science Foundation and the National Institute of Standards and Technology. He also participates in the annual Congressional App Challenge that encourages students across the nation to create their own apps and pursue careers in technology.

Close+up

POWERFUL PEERS

Technology opens new possibilities for for individuals around the world

Ask Jay Carpenter why he is involved in blockchain and he poses a question back to you: If you were waiting for a boat to take you and your family to a new life across the Mediterranean Sea, would you rather travel with a pocket full of Syrian currency, a bag of gold bullion, a pocket full of diamonds, or a 12-word phrase into which you can collapse your entire wealth and even expand upon it if necessary?

The founder of Desert Blockchain, an Arizona group devoted to exploring the potential of distributed trust technologies, says the right answer refers to the seed phrase that contains all the information you need to tap into your cryptocurrency wallet. "It's giving people like refugees from situations like Syria, like Venezuela, like North Korea a whole new horizon of opportunity and I think it gives all of us a new realm of opportunity, not only economically but also in our relationships" Carpenter says of the currency that exists on a blockchain.

Use of this peer-to-peer technology means it's happening globally and taking hold faster than the Internet, says Carpenter, recalling how the World Wide Web initially was open only to those who could afford to buy a personal computer to tap into the Internet and invest time to learn how to make it work. That is, it mainly was limited to those people in the United States and Europe. Now, "anybody who can text message can be part of this decentralized realm that is opening up," he says.

Carpenter is witness to a cross-section of Desert Blockchain participants, which include entrepreneurs, cloud storage providers, and aerospace and defense community members. He also sees employees from major financial enterprises such as banks and insurance companies involved on their own time and "people who are in government looking at it and saying, 'OK, how does this decentralization/blockchain thing impact our smart cities constructs? How's it going to impact space, power, water, all those things?'"

You will hear Carpenter use the word "decentralization" quite a bit: "Blockchain is only one subset of this thing called decentralization. It's a granting of powers among all of us." He's not saying it will replace the banks, assessors' offices and insurance companies; it just means we now have a new set of tools to control our finances, money or even identities. "It's like a whole new set of superpowers, just like the Internet was a whole new set of superpowers," he says. "Only these superpowers are probably even bigger and more profound than the introduction of the Internet."

And they come with opportunities. Carpenter says foremost is governance and policy. "Arizona is definitely at the forefront because the policymakers in Arizona have a vision for our state and beyond—actually, our country—transitioning from the legacy things that we're used to, to what I would call the contemporary and what's next," he says. "Policy and governance was a big piece of the Internet but it's an even bigger piece of this thing called decentralization."

It's lawmakers like Arizona Rep. David Schweikert, co-chair of the Congressional Blockchain Caucus, who recognize how profound and important this new decentralized realm will be for Arizona, Carpenter says. "It's not just Arizona competing with Nevada, and Colorado, and California and Wyoming or whatever," he says. "It's Arizona competing with Malta; competing with Zug, Switzerland, competing with Singapore."

The other key opportunity is the human interface that accompanies the peer-to-peer interaction. Blockchain "doesn't have a customer service number that we can call, it doesn't have a return policy," he says.

To learn more about Desert Blockchain, visit http://desertblockchain.com.

LINKS TO THE CHAIN

The potential for blockchain only seems to be limited by the imagination. Here are 10 areas tied to financial transactions that are gaining some traction with this new technology. To learn more about them and other industries that could benefit, the analysts at CB Insights offer a rundown at https://www.cbinsights.com/research/industries-disrupted-blockchain/.

ACCOUNTING: Layering in blockchain technology could make it easier to keep track of sensitive data as it is processed by accounting firms. Data tracking enabled by blockchain may also help to automate certain accounting services using artificial intelligence, which could reduce human error and instances of fraud.

CREDIT HISTORIES: An example is Lumeno.us, which normalizes semi-structured financial data using a proprietary application of collaborative tagging and advanced analytics. From there, it provides business owners the tools to share data in order to get a loan, find trusted partners, or manage a portfolio or network.

CROWDFUNDING: The crowdfunding industry emerged to "disintermediate" capital formation by giving backers (aka "pledgers") or individual investors the ability to directly fund creators and entrepreneurs, providing a natural alignment with blockchain capabilities.

FORECASTING: With an unshakably accurate transaction record supporting their data analyses, forecasting operations will have a stronger foundation for using machine learning algorithms to cultivate targeted predictions and insights.

GIFT CARDS AND LOYALTY PROGRAMS: Blockchains can help retailers offering gift cards and loyalty programs to make those systems cheaper and more secure. With fewer middlemen needed to process the issuing of cards, acquiring and using blockchain-reliant gift cards is more efficient and cost-effective.

HEDGE FUNDS: An example is Numerai, which takes the hedge fund model — employing a bunch of traders and quants — and decentralizes it. Numerai sends its thousands of disparately located quants encrypted data sets and asks them to build predictive models, and the best contributors are rewarded with the token called Numeraire. Then, Numerai takes the strategy and creates a meta-model to make trades.

INSURANCE: An example is LenderBot, a micro-insurance proof of concept for the sharing economy that demonstrates the potential for blockchain applications and services in the industry. It enables blockchain to serve as the third party in the contract between individuals as they exchange high-value items through the sharing economy.

PUBLIC ASSISTANCE: An example is GovCoin, which gives welfare recipients in the UK instant access to their benefits — paid in cryptocurrency through an app. Recipients can create their own digital "jam jars" for rent, utilities, etc., and distribute money among them in the app.

REAL ESTATE: Blockchain offers a way to reduce the need for paper-based recordkeeping and speed up transactions, helping stakeholders improve efficiency and reduce costs on all sides. Applications can help record, track and transfer land titles, property deeds and liens, and ensure all documents are accurate and verifiable.

STOCK TRADING: Blockchain-focused startups are looking to automate and secure the process of buying, selling and trading more efficiently. TØ.com, for example, integrates cryptographically secure distributed ledgers with existing trading processes to cut settlement time and costs, and increase transparency and auditability.

Close+up

RETURN ON INVESTMENT

Focus on FinTech delivers dividends for Bank of America and its customers

When you think of when financial technology first became part of our lives, your mind no doubt forms the picture of people walking into a building. Whether it was downtown or just down the block, a bank typically has been the place where we've cashed our first paychecks, opened our first checking accounts and applied for our first loans. As far as the technology component was concerned, you gave tellers your money and they worked their magic. No one ever invited you behind the curtain.

Then we all got smart. More specifically, the spark for change was ignited by the smartphone. "The phones have become an extension of us, so actually that's what fueled the mobile economy within the banking space," says Adriana Kong Romero, Tucson market president for Bank of America.

With roots dating back more than two centuries, Bank of America is an example of how an industry steeped in tradition can change with the times. With customers increasingly adopting new tech in their lives, the bank in turn has invested more heavily in it. The ROI: Mobile check deposits increased 450 percent year over year.

Perhaps surprisingly is that Bank of America's move toward mobile was driven by the consumer side of the bank, says Romero, with the business community catching up. Businesses now like the ease and flexibility offered through mobile devices. To help reach this point, the bank asked customers, "What would you like the power to do?" she says. As the use of tech has stopped being one-sided, so has the need to always bank in the building you remember. "We've become such a global society that it's not about doing business in the neighborhood you live in or work in," says Romero. "Now it can be anywhere around the world."

Looking behind the curtain, Bank of America has a focus on a digital security. Romero says, "We're integrating the retina technology, the fingerprints and even looking at the PIN side of it for credit cards—all that really helps keep secure when the clients of businesses are doing business on their mobile or tech devices."

As a result, the bank is drawing attention. It was ranked No. 1 for Security/Administration/Compliance in Greenwich Associates' Digital Banking Benchmarking study in 2018. More than

half the mobile users log in using biometrics.

For businesses, electronic mobile signature and document exchange trim processing time from four days to four hours. The bank is leveraging artificial intelligence and character recognition to automate matching payments and invoices, reducing the related time and hassles.

Romero herself is a fan of Bank of America's CashPro Mobile. Businesses that use CashPro can make mobile check deposits and digital disbursements. "It's creating an ecosystem," she says, giving businesses the power to incorporate their credit systems and cash management systems. "I think that's going to be a real game-changer for our businesses and commercial clients," Romero says.

Bank of America also has explored integration with their clients' own software, she says. For example, manufacturers use software specific to their own industry or nonprofits have software exclusive to their sectors. "We've really looked at is how our systems integrate with theirs so that it's a push and pull of information, helping them to be more efficient," Romero says. "So perhaps it's collecting on their receivables a lot quicker and knowing just in time when they're going to need to purchase more inventory or raw material."

She is well aware that that her industry is now filled with new choices offered by new players. Rather than see it as a threat, "I would say it's an opportunity," Romero says, "and the reason is because what we look at is the client continuum." Bank of America has its small business area in addition to commercial banking area, so as businesses grow "we're able to grow with them," she says. "Banking with individuals, we're able to grow with them as they go through the different life priorities of buying a home or now they're looking to retire. We're able to go with them through those different steps in life."

While this evolution has been designed with the customer in mind, it can offer its own set of challenges for another group: the employees, especially those who have spent most if not all of their careers at the bank. "It's not saying that anyone is going to be left behind but it's the adoption of it because that's what our clients are asking for," Romero says. Besides delivering what the customer wants, the bank also is investing in technology with its employees in mind. For example, instead of routinely remaining in the office to handle customer requests, employees are free to connect with the community while apps are put to use to gather information or provide other services.

Does all of this new technology ultimately make customers wiser when it comes to handling their finances? "Yes, I believe they would be from the perspective that it's more transparent," Romero says. "It's not having to wait for let's say the monthly statement to arrive at the end of the month."

In her role, she works on financial literacy with many nonprofits to help create a thriving community. For example, what are the barriers that need to be removed so that home ownership can become a reality? Related to that is setting up a rainy-day fund because the new homeowner can no longer call the landlord when something breaks down. Even with the help of technology, "there's different pieces of the financial literacy that I think still need to come into play in order to have a healthy financial picture," she says.

"The phones have become an extension of us, so actually that's what fueled the mobile economy within the banking space."

- ADRIANA KONG ROMERO, TUCSON MARKET PRESIDENT FOR BANK OF AMERICA

E-PAYMENT PIONEERS

Arizona companies made early inroads in secure online transactions

WRITING BY × JESSICA SWARNER

Financial technology may sound like a thing of the future, bringing to mind words like "blockchain" and "Bitcoin." But there are companies in Arizona revolutionizing the way we make payments right now, through means as simple as credit cards and electronic checks.

Base Commerce and SparrowOne are two of these companies. Neither is a fledgling startup — each has been in business in the Phoenix metro area for more than a decade. SparrowOne operates from Scottsdale while Base Commerce is based in Tempe and recently opened a sales outpost in Jacksonville, Florida. Both businesses were founded locally and have become part of the Phoenix area's burgeoning tech sector while making it possible for people and organizations to complete transactions online.

Base Commerce and SparrowOne handle something that customers often don't think twice about but definitely notice when it goes wrong: paying and receiving payments from people and companies online. This isn't as simple as processing the payments. It involves providing the necessary security checks to keep clients protected from data breaches and sensitive information out of the hands of malicious actors. As important for both clients and their customers is keeping things as simple as possible by striving to be a one-stop shop for all things electronic payments.

Base Commerce started out handling automated clearing house (ACH) payments, which is a system that deals with things like payroll, direct deposits and tax refunds. But the company later grew to also tackle credit card payments because, as COO David Schoenecker says, there was "more meat on the bones" going into bank cards. The company has about 70 employees and plans to continue growing. "We're a smaller, nimble company, compared to the likes of Worldpay, with thousands and thousands of staff," Schoenecker says. "So we're small enough with an entrepreneurial type of mindset but we have big boy toys, if you will. We have solid technology."

He says one of their specialties is working with merchants who may not have a strong grasp of how online payments work and struggle to meet security standards. "By working with us, we're able to check a lot of the boxes that they would be required to handle on their own," he says.

SparrowOne started out working with credit cards, as it was founded to support the U.S. Department of Defense Military Star Credit Card. With one of the most demanding clients possible, the company expanded from there. "There was a gap in payment processing technology for some of our customers," CEO Matanda Doss says. "We are a full-service payment provider. That includes payment processing, fraud prevention, security and compliance. Most companies just focus on the first two."

SparrowOne has more than a dozen employees and is continuing to focus on developing what it considers its niche: helping businesses and organizations shift from a reactive to a proactive stance when it comes to risk and compliance. Doss says companies that specialize in cybersecurity and compliance often focus on a broad set of industries while SparrowOne sticks to companies that accept electronic payments.

While the idea of securely facilitating payments through cyberspace may seem complicated, to the people using the system, it often seems frictionless. SparrowOne and Base Commerce make it look easy. As Schoenecker put it, "All we're really doing is making connections, right? We're moving money from one place to another."

Arizona Gov. Doug Ducey addresses the audience at the grand opening of Offerpad's new headquarters. He was joined by Rep. Jeff Weninger (left) and Brian Bair, the company's CEO and founder.

THE REAL DEAL

Property technology offers new opportunities

Arizona and real estate. For years, one seemed to be synonymous with the other. Arizona was hotter than hot when it came to buildings and land. Then the bubble burst and it seemed like things would never be the same for the residential and commercial sectors.

Thanks to action by the Legislature, new opportunities may replace hammers and nails with technology when it comes to real estate.

State Rep. Jeff Weninger introduced a measure to establish a property technology sandbox. Similar to the FinTech sandbox launched earlier, the PropTech version allows businesses to test innovative products or services in the real estate industry. By reducing expensive barriers to entry, the bill promotes the development of disru ptive technologies affecting the transfer and management of commercial and residential properties.

"PropTech is changing the way we rent, sell, buy, develop and manage property," according to Ducey upon signing HB 2673. "With this forward-thinking legislation, PropTech companies will have a place to develop and test their products—while benefiting and protecting consumers. With this bill, Arizona continues to send the message loud and clear that our state is the best place to develop cutting-edge technologies."

Weninger says, "This legislation gets government out of the way and sends a signal that Arizona will continue to take the lead in fostering innovation across all sectors, including the real estate industry."

A prime example of the potential level of innovation that the PropTech sandbox offers is what has happened with real estate tech leader Offerpad. Founded in 2015, the company brought together a leadership team with the collective experience of purchasing, renovating, and renting or selling more than 100,000 homes. They then incorporated data-driven technology solutions to determine neighborhood benchmarks when buying and selling homes, as well as identify potential market expansion to help provide investors and partners with needed information of company operations.

Offerpad's success and related growth was marked with the opening of a new custom-designed headquarters, which was attended by Ducey and Weninger. The Chandler site totals nearly 40,000 square feet—more than tripling the size of the company's previous space.

To help cultivate future players in the PropTech field, legislation requires the Arizona Commerce Authority (ACA) to establish a Property Technology Sandbox Program (PTSP) to allow companies to obtain limited access to the Arizona market to test innovative property products or services without obtaining authorization that otherwise might be required. ACA would develop details of the program in consultation with Arizona Department of Administration, the Arizona Department of Real Estate and other applicable agencies.

Program participants would be determined by ACA through an application process. Each participant would have 24 months after the date of approval to test the innovation described in the application. The program is scheduled to end July 1, 2029.

Arizona the TRAILBLAZER

'Sandbox' helps clear a path for new FinTech innovation

Arizona is home to the second-largest concentration of jobs in the business and financial services sector in the entire country, with one of the highest growth rates of employment in the industry. Financial firms from around the globe have found our state to be the ideal location to expand or relocate for many reasons—Arizona's top talent, business-friendly climate, affordable operating costs and incredible quality of life.

But these companies will also find that Arizona offers something no other state does: a bold initiative that encourages new business models and new technologies.

In 2018, Gov. Doug Ducey made Arizona the first state in the nation to establish a sandbox for innovative new financial technology, or "FinTech," positioning Arizona as the national leader the advancement of this innovation.

"FinTech is going to fundamentally transform banking, finance and technology," says Gov. Ducey at a recent event. "We're going to be the first in the country to embrace it."

And indeed we have. It's a big step forward for the future of the financial industry, and our state is at the forefront.

FinTech covers a wide range of innovations, from mobile banking, to cybersecurity to cryptocurrency to blockchain technology. Well-known companies like PayPal and Venmo fall into the category of FinTech, as well as up-and-coming startups like Mint, which offers its users budgeting and financial planning tools for their smartphones.

Recent studies show approximately 30 percent of digitally active consumers use at least two FinTech services regularly, with estimates that usage will grow exponentially over the next several years. In the first three quarters of 2018 alone, more than $54 billion was invested into global FinTech companies through nearly 1,200 separate deals. This represented a 66.9% increase in investment from 2017, a staggering leap for an industry in its infancy.

Financial experts predict that 2019 will produce even larger results, as banks and insurers find ways to partner with the companies bringing financial management right to your fingertips.

So why the need for a sandbox?

The FinTech sandbox is consistent with the effort to make Arizona the best state in the country for business, and the most attractive state in which to innovate and launch new technologies. The sandbox allows startups and entrepreneurs to release products in a controlled testing environment without excessive regulatory burdens and costs, which prevent many companies from getting to market.

Companies must go through an application process and can utilize the Arizona sandbox for up to 24 months, providing these tech leaders with a great opportunity to test and improve their products. With oversight of the Arizona Attorney General's Office, companies must adhere to rules that protect Arizona consumers.

The FinTech legislation was sponsored by State Rep. Jeff Weninger, who's become a prominent supporter of FinTech and blockchain technologies. "It was important for us to recognize the growth of these FinTech companies and how the rules and regulations of our past models could simply no longer keep up," says Weninger.

A small business owner, Weninger notes that most Arizonans and many businesses are already using FinTech apps whether they know it or not. But these apps aren't just for the consumer; they provide companies with the ability to complete transactions and increase efficiencies within their businesses.

Since the establishment of the sandbox, companies have been consistently signing up to "play."

Omni Mobile was the first approved applicant for Arizona's sandbox on August 3, 2018, and is testing its blockchain technology designed to improve cost-effective payment transfers at the Westward Look Wyndham Grand Resort and Spa in Tucson. New York-based Grain Technology Inc. and Scottsdale-based Sweetbridge were accepted into the FinTech sandbox late last year to test credit and lending products.

"We wanted it to be known that Arizona is a trailblazer when it comes to innovative industries like blockchain and FinTech, and now we're seeing the results," Weninger says.

From glowing profiles in Forbes to other states following Arizona's lead and introducing similar FinTech sandbox legislation, it's clear that we have drawn attention for our forward-thinking efforts. As more companies enter the world of technology-driven financial products and services, Arizona is committed to ensuring we are the best place for them to innovate and advance new solutions.

SANDRA WATSON is president & CEO of the Arizona Commerce Authority and co-publisher of TechConnect.

THE PERFECT BLEND

Alumnus spurs cryptocurrency innovation by combining business and tech

WRITING BY × JOE KULLMAN

Ryan Taylor

Ryan Taylor describes his most recent career transition as "a journey into a strange new world."

He entered the cryptographic territory of the blockchain nearly three years ago when he joined the team at Dash, an innovative open-source, digital currency payment network. The move took Taylor beyond the traditional realm of his previous jobs in business, technology and finance, and into the then-emerging cryptocurrency industry, which fittingly incorporates the three areas.

Two decades earlier, Taylor had entered college at Arizona State University as an electrical engineering major. Yet finding himself more attuned to business and economics, he eventually earned a degree in business management, all the while fostering a strong interest in new technologies.

He spent the next several years working in technical and business roles at Honeywell in its Business Technology Office and at the global management firm McKinsey & Company. During that time, he also earned a master's degree in business administration with a finance and economics concentration at Columbia University in New York.

He then went on to work as a hedge fund analyst, focusing on investments in the payments industry and FinTech—the computer programs and other technology used to enable banking and financial services. The expertise Taylor had gained in the payments industry would eventually arouse his curiosity about the potential of what entrepreneur Evan Duffield was doing with a startup cryptocurrency for payments he had founded called Dash, headquartered in Scottsdale. "I saw features that made Dash unique," Taylor says.

Instant point-of-sale transactions, privacy protection that made Dash safer and easier to use, a high-capacity network that can operate faster than most digital currency operations — those things and more attracted him.

In 2016, he joined the Dash team as director of finance but soon began shaping and solidifying Dash's overall business strategy and professionalizing its operations. Before long, Taylor was named CEO of the Dash Core Team, which is entrusted with developing the software that underpins the cryptocurrency network, as well as business development and marketing activities. "So, again," he says, "one foot in business strategy and one foot in technology."

The drive to elevate Dash brought Taylor back to his alma mater. He made connections with ASU leaders and faculty, mostly within the Ira A. Fulton Schools of Engineering. "We identified a lot of common interests and areas where we could collaborate and benefit from each other's resources and expertise," Taylor says.

In fall 2017, Dash supported the launch of ASU's Blockchain Research Lab directed by Fulton Schools Research Professor Dragan Boscovic. The blockchain is a decentralized, digital ledger system that is the foundation on which cryptocurrencies operate.

ASU's Blockchain Research Lab is focusing on conducting research to develop blockchain-based technologies for use in business, finance and economics, as well as sustainable engineering, computer science and other areas

Dragan Boscovic

where the technology can have a positive impact.

Since the lab was established in early 2017, researchers have partnered with dozens of industry leaders to provide blockchain solutions for real-world problems, Boscovic says. Dash was the first external partner and has contributed over $500,000 to the ASU Blockchain Research Lab to support research on blockchain scalability, block propagation protocols and zero knowledge proof identity management.

Dash's contributions are also providing student scholarships and support to develop a graduate-level engineering course to implement the blockchain across public and private applications, including FinTech.

The partnership "has already demonstrated its value for both sides," Taylor says. He points, for instance, to ASU research that provided solutions to keep blockchain transaction systems from slowing down and to help prevent network instability.

"We have an accredited research university working with us. I think it brings a lot of credibility to our project and our blockchain technology," Taylor says. "ASU has quantified things for us. We now have evidence that we can scale our business up much larger and do it safely without putting our users at risk. That has tremendous value."

ASU can look forward to some of its students getting internships at Dash, he says, while Dash's investment in ASU will help provide a well-trained talent pool from which it can recruit future employees.

Recalling his undergraduate experience, Taylor says he liked that as a large university offering an expansive array of studies, ASU provided a big landscape of potential career paths for students to explore. "I also liked that I got to interact with people from different places and different walks of life, and was able to create a sense of community within this huge place by joining student organizations," where he began developing leadership skills, he says.

Now Taylor likes that the university—and the Fulton Schools in particular—"is taking a very pragmatic approach to how they educate students and the research they are conducting, and focusing on how that research can have an impact on business and society."

His advice to today's students is to take advantage of the well-rounded education universities like ASU offer and not focus solely on studies in your career field. But all college students should be acutely aware "that we are entering a world where everything is being digitized, even our money," Taylor says. "Every industry one by one is becoming digitized and in a short period of time there won't be any industries that aren't tech industries."

Students in all fields "need at least a base-level understanding of technology, computer science, and programming and hardware," he says. "Those things are going to be profoundly important, no matter what industry you are going into."

To those who share his entrepreneurial bent, Taylor says they need to be prepared for a business environment in which the pace of disruption is accelerating. That environment is rife with threats, he says, but wherever there is disruption, there are also tremendous opportunities. "If you have a really good idea and can execute it well, then you can find success faster than at any point in history," Taylor says. "So, I don't think there is a better time to be coming out of school than right now."

JOE KULLMAN is senior media relations officer at ASU's Ira A. Fulton Schools of Engineering. Read more about the ASU Blockchain Research Lab at https://blockchain.asu.edu.

PRECIOUS COMMODITY

Startup captures power of data for price-risk management

WRITING BY ✕ PAUL TUMARKIN

In 2016, The University of Arizona licensed a commodity price-risk management web application to Tucson startup company HedgeSmart LLC. Roger Dahlgran, who was teaching and conducting research at the UA College of Agriculture and Life Sciences, created the system and launched the startup to maximize the impact of his research.

"If a producer or processor sees a current price that he or she would like to 'lock in,' HedgeSmart shows how to do this based on historic relationships between cash and futures prices. The past may not exactly replicate itself, so there is some risk," says Dahlgran, now retired from UA, "but HedgeSmart minimizes this risk."

Underpinning the HedgeSmart web application is a database of daily futures and cash prices that Dahlgran compiled during his 30-year academic career and still continues to update. The system selectively queries, combines and analyzes this information to provide price-risk minimizing hedging recommendations. It offers each user flexibility in modeling business operations and planning and production horizons, as well as in selecting the futures contracts to be used for hedging.

According to experts, the greatest challenge facing agricultural producers is commodity price volatility. HedgeSmart addresses this by helping farmers, agribusinesses and brokers reduce commodity price risks while making timely decisions about purchasing inputs and marketing output.

Tech Launch Arizona (TLA), the office of the UA that commercializes inventions stemming from UA research, facilitated the process of defining, protecting and licensing the intellectual property in the web application, and also provided guidance in the formation of the company. Ultimately, the office also led the process of licensing the web application to HedgeSmart.

In addition, TLA provided a spot in its National Science Foundation I-Corp grant program for the entrepreneurial academic, which helped Dalgran to further develop the HedgeSmart business model and provided a small grant to put towards identifying new customers.

In the few short years since, Dalgran has continued to move the company forward. His primary focus now is building a leadership team to help him put the company on a fast track to success.

"I'm on the lookout for a partner or partners who understand commodity markets, as well as connections with people involved in such markets," he said. "Tech Launch Arizona's I-Corps program taught me that worthy efforts require an effective team, and that to successfully launch a company, I need to get out of my office, away from the campus environment and talk to as many people as I can."

Standing beside a cohort of young upstart tech entrepreneurs, Dahlgran pitched the company in October at IdeaFunding, a 23-year-old event that brings together Arizona startup founders, mentors, advisors and investors to promote the growth of innovative companies and the economic growth of the city, state and region.

"Thirty years of academic research leaves you with some knowledge," says Dahlgran, who sits in the unique position of being able to look both back on a rich and productive academic career and forward to his impactful entrepreneurial future. "While we think critically about ourselves and our work, I've learned that my research yielded some great answers and insights, and I'm no longer questioning that. In fact, the conclusions I reached and used to develop HedgeSmart have turned out to be more true than I realized."

PAUL TUMARKIN is senior manager, Marketing & Communications, Tech Launch Arizona.

NO WEAK LINKS

Team tests method to bolster security for blockchain

WRITING BY × KERRY BENNETT

Cryptocurrency, or digital currency, was first introduced by Bitcoin in 2009. Since then, the market has since expanded to include many other brands such as Ethereum, Ripple, Litecoin and Zcash.

Because it is based on unique blockchain technology—a decentralized network that doesn't require a third party to process transactions—cryptocurrency operates independently from the global banking system. Data stored in a blockchain is permanent and cannot be modified, and it has been adapted for a wide variety of uses beyond cryptocurrency.

The privacy experienced by users of a network based on blockchain technology, however, is also a major drawback. Because users are nearly impossible to identify, these networks attract terrorists, criminals and black market businesses that wish to remain anonymous. Some experts believe, in fact, that blockchain technology poses one of the biggest potential threats to U.S. national security.

A team of cybersecurity researchers from NAU's School of Informatics, Computing and Cyber Systems was recently awarded a $125,000 grant by the U.S. Air Force Research Lab (AFRL) to study how to apply NAU's technology to secure the blockchain with novel digital signature schemes. The team is led by professor of practice Bertrand Cambou.

The project leverages another study recently completed by the team and funded by the AFRL and the Arizona Board of Regents. The earlier study was designed to determine the value of ternary computing—based on logic using three possible values instead of binary computing, which is based on two values—in strengthening cybersecurity.

"The long-term objective of this project," says Cambou, "is to develop an architecture that is compatible with cloud-based solutions, providing unprecedented levels of security to the blockchain technology with ternary computing and ternary physical functions (T-PUF), which are the 'electronic fingerprints' of advanced nanoelectronic devices."

The NAU team will work together during the preliminary phase of the research to design, characterize and validate a working prototype demonstrating the value of ternary computing to secure blockchains. Team members also include intelligent transportation system engineer Duane Booher, cybersecurity lab manager Ian Burke and Ph.D. student Christopher Philabaum, as well as graduate and undergraduate students.

This project is the first step of a wider multiyear research project to develop technology making blockchains resistant to quantum computer attacks, with the potential to have a significant impact on the way online transactions are protected in financial, governmental and industrial applications.

"This one-year project represents a preliminary phase to provide proof of concept of our long-term vision to secure blockchain with NAU technologies for the protection of strategic functions such as financial institutions, smart manufacturing, supply chain and inventory management," says Cambou.

KERRY BENNETT is Northern Arizona University's Research Communications Officer. Connect at nau.edu.

DEADLY DIFFERENCES

Study explains why more men than women succumb to disease

WRITING BY × STEVE YOZWIAK

a nationwide team of researchers that includes the Translational Genomics Research Institute (TGen), an affiliate of City of Hope, has identified molecular differences that explain why men die of glioblastoma brain cancer at nearly twice the rate of women.

The study, published in the prestigious scientific journal Science Translational Medicine, could help tailor drug treatments that are specifically designed for men and women based on their tumors' molecular subtypes.

"We have known for years that men contract and die from glioblastoma at a significantly higher rate than women," said Dr. Michael Berens, TGen deputy director, head of the TGen Brain Cancer Research Laboratory and a contributing author of the study. "We now have a much clearer understanding of this phenomenon, and this study should help us in the future to improve survival for all glioblastoma patients."

The research identified five distinct molecular signatures of glioblastoma each in men and women that help explain the underlying disparities in patients' response to treatments.

Glioblastoma is an aggressive disease, with a median overall survival of only 15 months for newly diagnosed patients. One of the major difficulties in treating glioblastoma is its intrusive penetration into adjoining tissues. This prevents the complete surgical removal of the tumors from the brain, even with follow-up radiation and chemotherapy. As a result, nearly all glioblastomas recur.

Studying adults with glioblastoma, researchers found that standard treatment for glioblastoma is more effective in women than men. Researchers reviewed patient MRI scans and survival data from a cancer research database. They then calculated tumor growth velocity every two months for the duration of therapy in 40 male and 23 female glioblastoma patients who received standard chemo-radiation treatment following surgery.

While initial tumor growth velocities were similar between women and men, only females showed a steady and significant decline in tumor growth after treatment with temozolomide, the most common chemotherapy drug used to treat glioblastoma.

Researchers tapped The Cancer Genome Atlas, a project launched in 2005 to pursue the genetic basis of cancer and funded by the National Cancer Institute and National Human Genome Research Institute at the National Institutes of Health. Researchers applied sophisticated statistical algorithms to distinguish male- or female-specific gene expression patterns. The team then focused on the sex-specific gene expression to identify molecular subtypes that corresponded to differences in survival for men and for women.

Specifically, the researchers showed that the tumors of patients with glioblastoma cluster into 10 distinct subtypes—five for tumors in males and five for tumors in females. The clusters are distinguished by gene activity and length of survival.

STEVE YOZWIAK is the senior science writer for the Translational Genomics Research Institute (TGen). Connect at www.tgen.org.

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