

## Client Focus

# Technology to Keep Driving Change

Tech innovations across business and daily life to gain more momentum in 2018

### CLIENT PROFILE

Deborah Quazzo shares her vision how technology is transforming education

### EQUITY RESEARCH

Disruptive tech sweeps across the industrial sector

### CLIENT FOCUS ONLINE

[williamblair.com/CFwinter2018](http://williamblair.com/CFwinter2018)





## What's Ahead for 2018

As we moved into 2018 the American economy stayed buoyant with business optimism about tax cuts and rollbacks in government regulation. Concluding one of the best years in a decade for world global growth and adding continued optimism in key economies overseas, equity markets pushed to new highs in January.

Volatility returned by February with investors reminded of challenges ahead. Economic forecasters expect that the Federal Reserve may raise interest rates three or even four times in 2018, with wage growth showing their best gains since 2009.

Bond yields pushed higher on those expectations as well as on forecasts for potential trillion-dollar federal budget deficits ahead. Trade also faces uncertainty with threats to NAFTA and disputes with China. Geopolitics—North Korea, Russia, Iran—remain worrisome.

While those wild cards will likely loom over the markets this year, economic fundamentals still look strong for 2018. Capital spending, consumer spending and confidence, and low unemployment are all positive for U.S. economic growth.

Beyond the statistics, a real engine transforming American life remains

technology—from work to our personal lives, schools to homes, wellness to every form of commerce.

This issue of *Client Focus* takes a look at this economic driver. Specifically, we spotlight how technologies behind artificial intelligence (AI) will be shaping the world we live in even more rapidly this year.

Howard Tullman, CEO of Chicago's entrepreneurial tech hub known as 1871, shares his thoughts on the coming trends. Established six years ago, the center has tripled its revenues and has been credited with helping create more than 10,000 new jobs since 2012. William Blair is proud to have worked with many of these start-ups.

This issue also spotlights the dynamic Deborah Quazzo, a long-time William Blair client, whose venture capital firm invests in education technology start-ups in the United States and around the world that are transforming K-12, higher education, and the workplace.

At the start of the new year I am also proud to announce two new community partners for William Blair, MAPSCorps and MetroSquash, which conduct innovative educational programs for wellness and youth development on the South Side of

Chicago. We look forward to working with both groups dedicated to serving families in our community.

It is sure to be a busy year ahead. A reminder that among the many ways we can serve your financial needs is through guidance on the sweeping new American tax regulations.

The 2018 changes affect each person, family, business and estate differently. I encourage you to contact your William Blair advisor to discuss any adjustments you and your family need to plan for.

Best wishes for a happy, healthy and prosperous new year. We appreciate the opportunity to work with you to meet your financial goals.

Sincerely,

John Ettelson  
President and CEO

# The Great Disrupter: Technology Transforming the Economy and Daily Life in 2018

From virtual reality and collaborative robots to Amazon delivering groceries, the sweep of technology across daily business and American life will gain more momentum in 2018.

Technology is sure to continue changing the face and shape of society as we know it—from our jobs to our homes to our schools to our activities.

“The future isn’t going to be a little bit different. It’s going to be radically different,” says Howard A. Tullman, chief executive of Chicago’s rapidly growing tech hub, 1871. Tullman has a ringside seat at the innovation table and brings more than 50 years of experience to the entrepreneurial hub.

“It’s not just about using new technologies to do a better job, it’s imagining new ways to do business with the technology,” Tullman says.

“When we look at something like the Tesla, we don’t think of it as a car with a few computer chips,” Tullman says. “We think of it as a computer on wheels. When you look at something like Uber, we don’t call that a different kind of taxi company. We call that a whole new solution for people’s transportation needs.”

**“Future proofing” businesses**  
Tullman says the ground-shifter is artificial intelligence (AI). Every industry, every company, every manager will need to find ways to

“future proof” their business and adapt to AI to survive.

Artificial intelligence—the ability of machines to improve performance without human intervention—is the core technology and disrupter. Computing power, clouds of data, and algorithms: any user of an ATM, Facebook, or online shopping already senses that “the machine knows me.” Machine perception, visualization, and voice recognition are already becoming central to how businesses

produce and deliver products and services faster and more creatively to stay competitive.

But despite this vast footprint already in society, more disruptions are coming.

William Blair economist Olga Bitel said during the firm’s global outlook forum in December that what lies ahead will be analogous to the changes that came from the steam engine, electricity, and desktop computing.



Howard Tullman, CEO of 1871

In 2017, factory automation and robotics were among the strongest equity performers. But manufacturing, healthcare, finance, retail, agriculture, education, media, and many other sectors are all adopting AI to improve their businesses and services.

“Most of the potential from AI is largely untapped,” Bitel said.

So far, retail has experienced one of the biggest adoption rates of AI to perform business operations, estimated at 30% by industry analysts, while manufacturing and healthcare lag at 5% and 10%, respectively.

**Online sales to speedy deliveries**

Retailers are getting better and better at grabbing our attention, Tullman says. It is a “mass customization” in which retailers personalize offerings based on past shopping data. Amazon leads the sector with 300 million individualized front pages on its website, created to meet each shopper’s interests.

“The CIO and CTO are going to be more important going forward than the CMO because the marketing

person is going to be relying more on the data and the information coming from these other departments,” Tullman says.

When it comes to delivering those products ordered online, logistical data is king. Tullman likes to cite UPS and its digital mapping as an example.

UPS trucks, it turns out, avoid left turns. Every morning the computer develops a delivery route for each truck based on its packages and specifies right turns to limit the amount of time waiting at intersections for left turns. Right turns have meant fewer accidents, and the routing system is saving UPS 10 million gallons of fuel annually.

*“Most of the potential from AI is largely untapped.”*

Amazon is rolling out Amazon Prime Now across U.S. metro areas where customers are promised to receive any of a vast number of items within two hours of an order. Among those products will be groceries from its Whole Foods division.

Digital networking is creating new ways to look at a society. It has led to Uber, Airbnb, Divvy bikes, and the whole “shared economy” where you use someone’s car, home or bicycle as needed—practices that no one would have considered a few years ago.

“Hotels are now saying we better get into this space too because millions of rooms across the country are not being sold by hotels; they are being sold by individual homeowners,” Tullman says of the AI-driven applications.

“It’s going to be about how digital your business is and how smart you are about your business,” he adds.

**Businesses evolve with AI**

The manufacturing and healthcare sectors are also adopting AI.

Collaborative robots with AI have vastly expanded the number of industrial production jobs that can be automated, says Nick Heymann, an equity analyst who co-heads William Blair’s global industrial infrastructure research team. At the same time manufacturers are struggling to fill 400,000 skilled jobs

**Global Market Outlook 2018: Economic Growth Stays Strong**



Strong global economic growth, strong corporate earnings, technology firms in the lead—those dominant 2017 features look set to carry over well into 2018, William Blair analysts told more than 300 guests at the firm’s Global Market Outlook Forum on December 7 in Chicago.

Olga Bitel, William Blair’s global economist, and Simon Fennell, a portfolio manager for international growth strategies, remain bullish on world economic growth since technological innovation is driving every industry, citing two specific subjects to watch: AI and China.

Speaking before the passage of the landmark Republican tax legislation, they noted the major policy issues to work through should be rising U.S. interest rates and major changes to taxes. U.S. fiscal deficit and inflation will remain a key factor in any revival of market price volatility in 2018, they said.

Read more at [williamblair.com/GMO2018](http://williamblair.com/GMO2018)

# Disruptive Technology to Sweep Across Industrials

that include many maintenance and robotic engineering skills, he adds.

At auto dealerships watch for 3-D printers. Replacement parts will be created on site, saving time and delivery costs.

In healthcare, mobile apps help consumers find doctors, price services, and provide virtual follow-ups without additional doctor visits.

“Innovations in predictive analytics also will drive change,” says Ryan Daniels, a William Blair healthcare research analyst.

Such analytical software is already used to improve care by forecasting everything from the likelihood of a patient being readmitted to a hospital to developing a life-threatening infection while in a facility.

*“Each time we use these systems, they get smarter and smarter...”*

## **The next wave: messaging and voice**

The next big wave of AI application is already around us: messaging and voice. Amazon’s Alexa, Apple’s Siri, Google Voice, and other voice products are inside our phones, cars, and homes by the millions.

“During the holiday season the Alexa-enabled Dot was the No. 1 selling item in the Amazon store across all categories,” says Ryan Domyancic, a William Blair consumer sector analyst, in citing the expansion of voice technology. “There’s this virtuous cycle where we could see Alexa grow up in 2018.”

This year, expect Alexa’s voice to cover even more ground and customers as “she” partners with third-party developers to expand services and becomes a much bigger part of the American family—from refrigerators and alarm systems to smart beds and toilets.

“Each time we use these systems, they get smarter and smarter and our job gets easier and easier,” Tullman says.

The U.S. industrial sector is poised for strong growth in 2018 as structural changes within the sector to create value come as technology innovation accelerates, says Nick Heymann, William Blair co-group head of global industrial infrastructure research. Additionally, industrial demand looks as good as it has in 10 years.

Two of the biggest changes Heymann and his team are tracking: robotics and additive metal manufacturing.

Demand for the skilled workers to ensure precision robotic production stays online is likely to rise as more manufacturing returns to U.S. shores in coming years.

Heymann cited RBC Bearings as a company leading in robotics. As a ball bearing manufacturer, its role in supplying parts to its customers on tight schedules in the transportation sector is critical. So its expansion of robots has been key to maintaining its top record for just-on-time delivery of parts on demand.

“By 2020, they expect to replace 40% of their direct labor force with collaborative robots,” Heymann says.

The boom in robotics and AI is also beginning to integrate into the industrial manufacturer process by digitally linking a company’s production site with its suppliers so they together can “mass customize” their services to meet each customer’s needs. Parts will be created on site from a metal powder using high-tech laser-powered 3-D printers, a process referred to as additive metal manufacturing (AMM).

“When AMM is linked to real-time predictive analytics, manufacturers can produce the exact product a customer will need before they know they need it,” Heymann says.

AMM is being rolled out selectively at some of the largest companies like General Electric and Siemens, which have bought AMM machine manufacturers. But Heymann expects the amount of investment in AMM to soar early in the 2020s once companies adopt the latest integration technology, such as Rockwell Automation’s software, which links all of a company’s plants within their supply chain.

*To receive William Blair research reports, contact your advisor. Visit [williamblair.com/ResearchCoverage](http://williamblair.com/ResearchCoverage) for disclosure information.*

# A Passion for Learning: Deborah Quazzo's Burning Mission for Education Tech

*As an investor and community leader, Deborah Quazzo is an education advocate.*



Deborah Quazzo

Venture capitalist Deborah Quazzo says she was lucky to learn valuable lessons early in life. Growing up, she felt deeply that education was a key to life-long happiness and success. She also learned that you have to push for what you believe in.

So as a high school student in Jacksonville, Florida, she challenged the school board for not having any women as members. Eventually, one was appointed: her mother.

After graduating from Princeton with a degree in American history and women's studies, Quazzo joined J.P. Morgan as an investment banker. She later earned an MBA from Harvard and joined Merrill Lynch, rising to become managing director of its Global Growth Group.

At Merrill, she met her current business partner, Michael Moe, who had begun looking at the education tech sector as an investment category in the 1990s. Today, their venture capital fund GSV Acceleration has become a major driver in the multibillion-dollar education and talent technology business.

Quazzo, a long-time client of William Blair wealth advisor Cam McKinney, is based in Chicago. She and her husband Stephen, a well-known real estate investor, are active in the community as philanthropists with a focus on education.

## **Personalized learning**

GSV invests in dozens of education tech start-ups like Clever, ClassDojo, Course Hero and Degreed. Quazzo consults throughout the country and overseas to promote the cutting-edge technology that is transforming K-12, higher education, and enterprise learning programs.

"We like to think about giving all people access to the future through education," she says. "We as a country were not going to get there, given how far behind we were, without the aid of some technologies to give leverage to teachers, faculty and individual learners."

She says the road to success is the personalization of learning through "smart" technology including AI. And that need is as important in the workforce as it is in K-12 and higher ed.

"What you're seeing is the rapid obsolescence of jobs," she says. "AT&T has been very public in saying most of its workforce is not skilled today to do even the jobs they are supposed to be doing, certainly not the jobs they are going to be doing in five years.

"Personalized technology is transcending work and transforming education," she adds. "It really started in K-12 because we had kids sitting in the same classrooms with dramatically different levels of competence and their needs were not being addressed."

## “Personalized technology is transcending work and transforming education.”

Chicago Public Schools, where she was an advisor for two years, is a great example of a system adopting student-driven technology with great success.

Quazzo cites a 2017 Stanford University study concluding that CPS elementary students made the fastest academic progress of the 100 largest school districts in the country from 2009-2015.

Tech is driving the difference. Lexia Learning Systems, a reading and writing program, was introduced in the Chicago classrooms several years ago by Leap Innovations, a nonprofit nurtured at the city’s tech hub 1871.

Lexia helps students plan, write, edit, and publish digital texts through online activities. Tailored feedback from each student’s use of the program, at their own speed, assists word retention, grammar, punctuation, and organization of the writing.

Another popular tech program is Dream Box, an online K-8 math platform, says Quazzo, who is an angel investor in the company. Algorithms capture every key stroke a child makes when adding numbers, assessing each child’s math skills and using the data to tailor math tutorials and examples for each student to pursue and master.

“Initially there was concern that the technology would eliminate teachers’ jobs,” Quazzo says. “But instead, these

tools allow teachers to use data to guide instruction.”

The result of such personalized learning is striking. “There are clearly lessons to be learned in Chicago,” the Stanford study concluded, citing “rapid and substantial learning gains ... that benefit students of all racial and ethnic groups equally.”

Such personalized tech will be the focus of GSV’s annual education conference in April, an event it has co-sponsored with Arizona State University. The 2017 conference drew 3,500 attendees.

“It’s not just learning. It’s applying AI to better recruiting, keeping people engaged. People are learning differently, acquiring skills differently,” Quazzo says.

### **China: education is top focus**

The stakes for America couldn’t be higher. Nowhere is the push for education higher than in China, Quazzo says. At a Global Education Summit in Beijing last November, where Barack Obama was the keynote speaker, she saw it firsthand.

“Education is not looked at philanthropically in China,” she says. “It’s looked at as an economic imperative: this is how we win.”

Summit speakers detailed how the internet, big data, AI, VR, and other technologies are integrating into Chinese education and changing

people’s ways of thinking, working, living, and learning. In Asia and China, 15% of the household income is spent on education, versus 2% in the United States, according to government and industry data.

“The Chinese won’t settle for a public school that doesn’t get their kids to the top,” Quazzo says. “They are going to spend every dollar they’ve got to get kids there.”

She cites VIPKid, an online teaching platform where children in China learn English from North American teachers. Founder Cindy Mi has grown VIPKid to several hundred million dollars in revenue in just three years as the appetite for Chinese to learn English from native English speakers is high.

Tal Education Group is another Chinese company that provides supplementary learning programs for after-school, weekends, and summers. It is now increasing use of digital products with instruction offered K-12 in mathematics, physics, chemistry, biology, history, geography, political science, English, and Chinese.

“Tal has a market cap of \$16 billion, the largest education company in the world, and nobody has heard of them,” Quazzo says. “It’s embarrassing how hungry the Chinese are to have their children learn things compared to the U.S.”

*William Blair*

The William Blair Building  
150 North Riverside Plaza  
Chicago, Illinois 60606

PRESORTED  
FIRST CLASS  
U.S. Postage  
PAID  
Oakbrook, IL  
Permit #100

Past performance does not guarantee future results. This is not in any sense a solicitation or offer of the purchase or sale of securities. The factual statements herein have been taken from sources we believe to be reliable, but such statements are made without any representation as to accuracy or completeness or otherwise. Opinions expressed herein are our own unless otherwise stated and are current opinions as of the date appearing in this material only. These materials are subject to change without notice. From time to time, William Blair & Company, L.L.C. or its affiliates may buy and sell the securities referred to herein, may make a market therein, and may have long or short position therein. Prices shown are approximate.

This material is distributed in the United Kingdom and European Economic Area (EEA) by William Blair International, Ltd., authorized and regulated by the Financial Conduct Authority (FCA), and is directed only at, and is only made available to, persons falling within Article 9, 38, 47, and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (all such persons being referred to as "relevant persons"). This document is intended for persons regarded as professional investors (or equivalent) and is not to be distributed or passed on to any "retail clients". No persons other than persons to whom this document is directed should rely on it or its contents or use it as the basis to make an investment decision.

William Blair & Company and the script logo *William Blair* are registered trademarks of William Blair & Company, L.L.C. William Blair & Company Client Focus ©2018, William Blair & Company, L.L.C. All rights reserved. Member FINRA • Member SIPC

---

CLIENT SERVICE

## 2018 Tax Reference Guide Available

William Blair's 2018 Tax Reference Guide is now available. The guide provides the latest information on tax rate schedules, exemptions, and contribution limits on savings plans based on the new tax reform law.

Passage of the Tax Cuts and Jobs Act in December 2017 produced some of the most significant changes to the nation's tax system in decades. These changes cover income earned in 2018 and tax returns to be filed in early 2019.

The new tax law will affect each person, family, business and estate differently. Contact your William Blair advisor to discuss any adjustments you might need to make regarding tax efficiency, retirement planning, philanthropic strategies, business and estate planning.