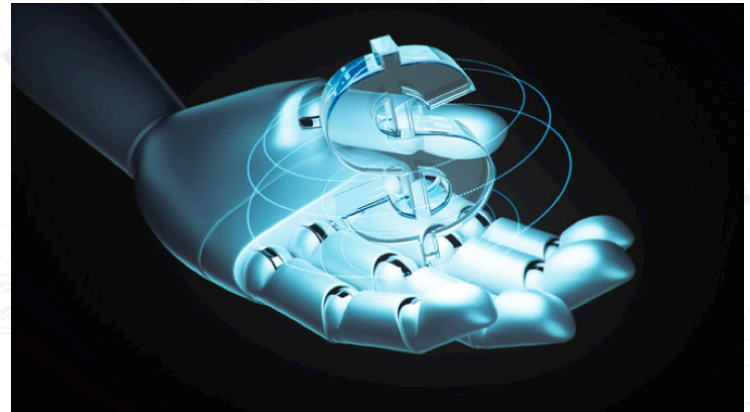


# FOLLOW THE MONEY IN ROBOTICS, AUTOMATION & AI: M&A AND FUNDINGS ACCELERATE IN 2018

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For investors in Robotics, Automation and AI (RAAI), the news couldn't be better. In the past 24 months, the ROBO Global Robotics & Automation Index returned a remarkable 63%, significantly outperforming broad global equity market indices.<sup>1</sup> Quarter after quarter, the financial markets continue to highlight RAAI as one of the most important investment opportunities of our generation.



What sets RAAI apart from other industries to fuel its continued growth? The catalysts are many. First, demand for RAAI technologies and applications is increasing dramatically, in part because the world is now generating unimaginable quantities of big data—the fuel that powers machine intelligence. Second, innovation is enabling rapid reductions in costs, as well as dramatic increases in performance capabilities. Innovations in sensing, computing, communication, and more are changing not only how RAAI is applied in nearly every industry and every geography, but also the future of robotics as we know it. This shift is driving a tremendous wave of activity in mergers and acquisitions (M&A) and fundings worldwide.

## M&A WITHIN THE ROBO GLOBAL INDEX & BEYOND

New M&A announcements seem to come every day—a fact that is evident in the select universe of ROBO Global Robotics & Automation Index members. Nine index members have been acquired since the inception of the index in 2013, and another four were targets of failed takeover attempts. M&A activity—both completed acquisitions and ongoing attempts—is continuing to accelerate:

<sup>1</sup>Since inception on 23 Oct 2014, the ROBO Index returned a total 14.2% per annum compared with 6.4% for the MSCI ACWI. Data as of June 26, 2018.

DATE	Aquirer	TARGET (ROBO Index Member)	Deal Value (\$mm)	Completed
9/25/13	Stryker	Mako Surgical	\$1,650	YES
4/11/14	Ametek	Zygo Corporation	\$280	YES
6/18/14	TE Connectivity	Measurement Specialties	\$1,700	YES
9/26/14	KUKA	Swisslog Holdings	\$357	YES
9/20/15	Dialog Semi	Atmel Corporation	\$4,600	NO
5/18/16	Midea	Kuka	\$5,000	YES
5/19/16	FMC Corp (merger)	Technip (merger)	\$13,000	YES
10/26/16	GE	Arcam	\$700	YES
10/26/16	GE	SLM Solutions	\$733	NO
12/12/16	Teledyne	E2V Technologies	\$789	YES
3/13/17	Intel Corp	Mobileye	\$15,300	YES
10/31/17	Emerson	Rockwell	\$29,000	NO
11/6/17	Broadcom	Qualcomm	\$146,000	NO

A brief look at the highlights demonstrates the intense push for companies to acquire the technologies needed to create new competitive advantages.

- **Emerson Electric and Rockwell Automation**

In November 2017, Emerson Electric unveiled a third bid to acquire Rockwell Automation, the largest pure-play industrial automation company outside Japan, for an astounding \$29B, more than double its market value at the beginning of 2016. Emerson, desperate to improve its growth profile after years of disappointing sales, had announced a major portfolio reshuffling in 2015 and committed to focus on industrial automation to support its long-term growth. Yet despite what looked like a very rich valuation, it was not enough to convince Rockwell's board to accept the offer.

- **Intel and Mobileye**

Earlier in 2017, Intel paid \$15B to acquire the driverless car technology company Mobileye. Dozens of other transactions were initiated in 2017—all on the heels of 2016, a banner year in which more than 50 robotics and automation companies were acquired for an incredible \$20B+.

- **Teradyne and MiR**

In April, index member Teradyne, a leader in automated test equipment, acquired Danish robotics company Mobile industrial Robots (MiR) for \$148M. A follow up to its successful 2015 acquisition of collaborative robot leader Universal Robots, the decision to purchase MiR's fleet of autonomous warehouse robots that can lift and pull pallets in distribution centers was one more step in Teradyne's clear pivot towards industrial robotics and software. The move seems to be a natural fit for Teradyne as it continues to diversify its business away from testing electronics and components and work toward global market leadership in collaborative industrial robots—now its fastest growing business unit. Teradyne plans to use its own global distribution model to distribute MiR capabilities on a global scale. With the addition of MiR, Teradyne upped its growth projections to +50-55% in its industrial automation division alone, bringing the revenue contribution to 30% of total sales by 2021.

It's important to note that nearly half of the 2016 acquisitions involved Chinese deals, including the \$5B acquisition of German industrial robotics company Kuka by China's leading appliance maker Midea. A global giant in robotics innovation, China is expected to continue to lead M&A activity moving forward. Also in play are key software deals in industrial automation, such as Siemens' \$4.5B acquisition of Mentor Graphics, and others by companies including Google, IBM, Yahoo, Intel, Apple, Samsung, and Salesforce, who are all competing head-to-head in an acquisitions race, with more than 40 deals announced last year alone.

In the past two years, large industrial companies have also accelerated acquisitions in 3D printing, particularly on the metal side of the industry. GE spent over \$1B dollars to purchase ROBO Global index members Arcam and Concept Lasers, although it failed to acquire another index member, SLM Solutions. Meanwhile, Siemens acquired Materials Solutions, and DMG Mori acquired Realizer.

In the first half of 2018, an impressive 43 M&A deals were announced, involving 28 ROBO Global index members. This uptick in deploying capital to complete strategic acquisitions is likely to continue for the remainder of the year across all regions.

Announce Date	Acquirer Name	Target Name	Total Value (\$\$)
1/4/18	Trimble Inc	Stabiplan BV	Unknown
1/4/18	Nordson Corp	Sonoscan Inc	Unknown
1/31/18	QIAGEN NV	STAT-Diagnostica	\$191
2/1/18	QIAGEN NV	STAT-Dx Life SL	\$147
2/1/18	Amano Corp	Valet Parking service business	\$21
2/2/18	Trimble Inc	e-Builder Inc	\$500
2/5/18	Varian Medical Systems Inc	Mobius Medical Systems	Unknown
2/7/18	Siemens AG	Sarokal Test Systems Oy	Unknown
2/8/18	Cargotec Oyj	Marine & offshore/TTS Group ASP	\$107
2/9/18	FANUC Corp	Life Robotics	Unknown
2/14/18	Optex Group Co Ltd	CCS Inc/Japan	\$87
2/16/18	PTC Inc	Waypoint Labs	Unknown
2/20/18	Topcon Corp	Clearedge3d	Unknown
2/22/18	Varian Medical Systems Inc	Evinance Innovation	Unknown
3/1/18	Microchip Technology Inc	Microsemi Corp	\$9,838
3/2/18	Deere & Co	King Agro SA	Unknown
3/5/18	Oceaneering International Inc	Ecosse Subsea Systems	\$69
3/15/18	Hexagon AB	AGTEK Development	Unknown
3/28/18	Brooks Automation Inc	Tec-Sem Group AG	\$16
3/29/18	Teradyne Inc	Energid Technologies	Unknown
4/20/18	Trimble Inc	FabSuite LLC	Unknown
4/23/18	Trimble Inc	Viewpoint Inc	\$1,200
4/23/18	Hexagon AB	Licom Systems GmbH	Unknown
4/24/18	Brooks Automation Inc	BioSpeciMan Corp	\$5
4/25/18	Teradyne Inc	Mobile Industrial Robots ApS	\$147
5/1/18	Schneider Electric SE, Temasek Holdings Pte Ltd	Tamco Elec. & Switchgear, Henikwon, L&T, Kana	\$2,101
5/3/18	Novanta Inc	Zettlex Holdings	Unknown
5/15/18	Hexagon AB	NEXTSENSE GmbH	Unknown
5/17/18	Siemens AG	J2 Innovations Inc	Unknown
5/19/18	Nuance Communications	Voicebox Technologies Inc	\$82
5/23/18	Siemens AG	Enlightened Inc	Unknown
6/1/18	Optex Group Co Ltd	Three Ace Co	Unknown
6/2/18	Hexagon AB	AutonomouStuff	Unknown
6/6/18	Duerr AG	Babcock & Wilcox MEGTEC & Universal	\$130
6/14/18	Dassault Systemes SE	Centric Software Inc	Unknown

Announce Date	Acquirer Name	Target Name	Total Value (\$\$)
6/14/18	Hexagon AB	CAD Training Technologies	Unknown
6/19/18	Hexagon AB	Spring Technologies SAS	Unknown
6/22/18	Siemens AG	Austemper Design Systems	Unknown
6/26/18	Siemens AG	Building Robotics Inc	Unknown
7/3/18	Omron Corp	3a Health Care Srl	Unknown
7/5/18	Zebra Technologies Corp	Xplore Technologies	\$81
7/6/18	ABB Ltd	Ab Rotech	Unknown
7/9/18	Autodesk Inc	Assemble Systems	Unknown

## A growing focus on software

While the majority of acquisitions in the past five years were in the industrial robotics and automation sectors, 2018 has brought a growing focus on acquisitions among key software providers.

### • Rockwell and PTC

Last month, Rockwell announced a \$1B investment in PTC, a member of the ROBO Global Index and a leader in computer aided design (CAD) and product lifecycle management (PLM) software. Shares of PTC have risen more than 11% since the announcement and more than 59% year-to-date<sup>2</sup>, boosting its market valuation to a record \$11B. Though the completion of the deal is still pending, this strategic partnership is expected to accelerate growth for both companies and enable them to be the partner of choice for customers focused on digital transformation. The move is an important signal that Rockwell is firmly committed to strengthening its software technology capabilities.

### • Siemens AG and Mentor Graphics

Last year, Siemens AG acquired Mentor Graphics for \$4.5B. By purchasing a leading electronic design automation software developer, Siemens was able to expand its opportunities in IoT, high-speed communication, and the cloud—without the time or expense of developing new software.

### • Trimble, Viewpoint, and e-Builder

Another ROBO Global index member, Trimble, made two significant software acquisitions in the past 12 months. Its recent acquisition of Viewpoint Construction Software for \$1.2B is part of a larger strategy to focus on construction management workflow solutions and is indicative of its decision to shift its legacy hardware business to a software-driven business. This change in strategy should enable Trimble to thrive as a provider of solutions to engineering and construction companies who

are desperately seeking to improve efficiencies. Last year, Trimble made a similar move when it acquired e-Builder, another construction workflow software provider. It was the first step in building out its cloud platform and cloud services. When we spoke to the Trimble management team at its investor day in May, it was made clear that their goal is to quickly position the company as a leader in helping the construction industry move to the cloud—and to become a primary beneficiary of that critical transition.

### • Cognex, EnShape, AQSense, and ViDi

A global leader in machine vision, Cognex acquired three software companies in the past 18 months. In late 2016, the company expanded its 3D vision capabilities with its acquisitions of EnShape GmbH, a maker of advanced 3D vision sensors, and AQSense, a provider of 3D vision software—a move that accelerated its push into the fastest growing segment of the machine vision market. In 2017, the company acquired ViDi Systems SA, a maker of deep learning software for industrial machine vision. The plan is to integrate the ViDi software into the Cognex platform, significantly broadening the scope of applications that can be addressed by its solutions.

### • SPX and CUES

In May, inspection equipment company SPX acquired CUES, a robotic pipeline video inspection and rehab company, for \$189 million.

We anticipate additional partnerships and deal activities involving software companies in the coming months. Integrated, data-driven software solutions are vital to technology leaders' quest to improve the customer journey and overall customer experience. Large vendors are urgently replacing older IT technologies in an effort to compete in the digital age. To catch up as quickly as possible, many are choosing to acquire already successful software companies to facilitate a rapid business transformation.

<sup>2</sup> As of 9 July 2018

### The push toward industrial robotics

In the area of industrial robots, China has made enormous progress. Chinese manufacturers are under extreme pressure from the government to automate (see China’s Push Toward Excellence Delivers a Global Robotics Investment Opportunity). The China 2025 initiative is creating huge demand for Chinese companies to deliver industrial robots that increase efficiencies and lower costs—fast. According to the International Federation of Robotics (IFR), China is expected to have 1M industrial robots in operation by 2025, up from about 300,000 units in 2016.

As mentioned above, Midea, China’s leading producer of appliances, acquired German industrial robotics company Kuka for \$5B in late 2016. Leveraging Midea Group’s local network, Kuka is now forecasting sales of \$1.24B in China by 2020, more than double its current business in the world’s largest robotics market.

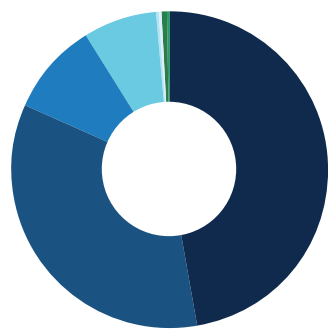
That’s just the beginning. ChemChina acquired German company KraussMaffei in 2016; Chongqing Nanshang Investment Group’s acquired HTI Cybernautics in October 2017; and Huanchangda Intelligent Equipment acquired Robot System Products, a spin-off from ABB, in November 2017. We expect this aggressive strategy to continue as China strives to make the country into one of the world’s top-10 most intensively automated nations by 2020.

Outside of China, Hexagon, the Swedish conglomerate that integrates sensors and software into precision measuring, purchased AutonomouStuff, a developer and supplier of autonomous solutions, estimated to be around \$160M. Meanwhile, Microsoft continued its active acquisition streak by acquiring BonsaiAI to build the ML model for autonomous systems of all types.

## GLOBAL INVESTMENTS IN RAAI

Meanwhile, the funding for early-stage growth companies in RAAI continued its record climb, with \$7.1B in funding in the first half of 2018, according to The Robot Report. An impressive 27 startups were funded in June alone, for a total of \$2.1B. Seed and Series A deals accounted for at least 50% of the deal share in the last few years, according to CB insights. In addition, deals outside of the US are also on the rise, with Asia taking the helm.

**YTD Robotics Funding segments (Private companies)**



Autonomous driving	\$1.2B
Consumer	\$870M
Warehouse	\$240M
Healthcare	\$185M
Ag Tech	\$11M
Drones	\$9M
3D	\$13M
Construction	\$1.2M

The most active funding has been in two segments: autonomous driving and consumer robotics, raking in record investments of \$1.4B and \$960M, respectively. For AI technologies, global market leaders are acquiring artificial intelligence talent or AI startups. CB Insights found that a total of 115 AI startups were acquired in 2017 alone, with Google taking the lead at 15 acquisitions.

- **SenseTime**

In April, SenseTime, a Chinese deep learning and facial recognition software provider focused on smart self-driving systems, raised \$620M in a Series C funding round led by Alibaba Group.

- **JingDong (JD)**

In June, Google announced it is investing \$500M in JD (JingDong), the Chinese equivalent to Amazon and the country's second largest e-commerce provider. With this investment from Google, JD expects to staff at least 1,000 robots in its restaurants by 2020. Like Amazon, JD is a leader in automated logistics. With this new investment, JD plans to open restaurants staffed by robots starting as early as this summer, and ramp that number up to 1,000 by 2020. JD recently launched 20 mobile robot carts in the Beijing area and has been partnering and investing in smart logistics, online grocery shopping, virtual assistant shopping and same day delivery.

- **CMR Surgical**

In June, CMR Surgical raised \$100M in a Series B funding round led by Zhejiang Silk Road Fund and including existing investors Escala Capital Investments, LGT, Cambridge Innovation Capital and Watrium. Based in Cambridge, UK, CMR Surgical is the developer of the Versius surgical robot system, one of the most important innovations in healthcare robotics. The company employs over 200 people and is close to submitting its surgical robotic system for regulatory approval in the US.

## THE OPPORTUNITY FOR INVESTORS

Corporate giants around the world are aggressively deploying capital to develop and acquire the RAAI technologies they need to take business to the next level. As a result, global deals in the first half of 2018 broke new records for the period, driven by a wave of megadeals in media and telecommunications, according to Thomson Reuters<sup>3</sup>. At the same time, investors are continuing a decades-long push in the direction of robotics, automation, and AI. It seems that the writing is on the wall: RAAI is an opportunity that promises nearly inevitable growth. The question for investors today is not whether to pursue the opportunity of RAAI, but rather how to effectively 'follow the money' to make the most of this vital investment opportunity today.

**To learn more about ROBO Global and the ROBO Global Robotics & Automation Index, visit**

**WWW.ROBOGLOBAL.COM**

<sup>3</sup>\$2.4tn of transactions already struck this year, a record-high level, including 35 deals worth at least 11 figures.