Takeaways from our FoF field trip to Automatica trade fair

Emerging factory automation technologies are gaining traction

We hosted a Factory of the Future field-trip for investors at Automatica trade fair in Munich, Germany on June 25, 2016. The fair showcased the world’s leading technologies in robotics, motion control and machine vision systems, attracting 45,000 visitors (+30% yoy).

Top 10 takeaways

1. Machine communication is improving as corporates integrate industry standards (e.g. OPC-UA), develop open-source products and use simplified programming software (e.g. Yaskawa’s Motologix).
2. Universal Robots’ cobots have a payback of 6 months and overall installation costs at <2x cost of robots vs. >3x for traditional robots. Cheapest UR cobot costs just €20k.
3. Cobot competition is picking up as Yaskawa entered the race and Fiat Chrysler’s Comau are pioneering solutions to concerns about speed.
4. Universal Robots believes its sales network, brand and open-source strategy will be important to lock-in and outgrow the cobot market.
5. Yaskawa demonstrated five of its new product launches, underpinning our growth expectations and mix improvement as it increases appeal in general industry.
6. Machine vision is a >$2 bn market, despite in a current downturn, according to the Association for Advancing Automation (“A3”).
7. Beware of the buzzwords: Most notably, AI and cloud robotics. A3 thinks it might take decades to get commercializable AI products.
8. Despite the absence of a major global robotics player, the US (where robotics is growing double digit) is still at the forefront in automation, by developing the embedded technologies required.
9. Flexibility and efficiency are crucial in leading autos factories, as BMW produces a car in 44 hours with no two likely to be the same each day.
10. The average age of workers in BMW’s Welt factory is rising (43 vs. 40 a few years ago) as new technologies, such as exoskeletons, are increasing the longevity of employees.
Key takeaways from our 2016 Automatica field trip

Key takeaways from four of our meetings are as follows:

Teradyne (TER; Neutral, last close $18.54): Amidst impressive growth, Universal Robots is preparing for tougher competition

Universal Robots ("UR"), Teradyne's market leading collaborative robots business, hosted a booth tour. Key takeaways were:

1. With the cobot market growing >50% pa in recent years, Teradyne is targeting $90 mn to $100 mn in revenues for Universal Robots for 2016. UR believes this fast growth is unlikely to hit capacity constraints as its current Denmark-based manufacturing set-up can generate $500 mn in revenues without the need for significant factory capex.

2. The customer base for Universal Robots consists largely of SME enterprises in a wide range of end markets. As a result, its method-to-market and ease-of-use is key to achieving rapid organic growth. It uses distributors (which pick up servicing margin in return for broad dissemination) and a user friendly set-up, eliminating the need for third party engineers to program the robot.

3. Universal Robots believes that its technology is 2-3 years ahead of competitors (15 other booths at the fair were using UR cobots), however it is aware that the competition is increasing significantly. Leveraging Teradyne's balance sheet they believe acting quickly and the use of their open-source platform (meaning that a wide range of components are easy to develop, described as an “App store” approach) is key to dominating this quickly evolving market.

Yaskawa Electric (6506.T; Buy, last close ¥1,259): New product launches underpin our bullish view on mix improvement

Yaskawa hosted a booth tour and interview with its EU operations management. Key takeaways were:

1. We came away more confident on the product mix improvement we expect in the next 12-18 month. The company also exhibited some brand new products:
   - 10kg payload collaborative robots
   - 7-axis robots with the newest spot welding gun and smaller, low pay-load robots ideal for general industry.
   - Motologix software (bridging machine communication between controllers and PLCs) and VIPA (acquired German PLC technology).

2. Looking at collaborative robots specifically, we believe the company has strong positioning as one of the “Big Four” robotics company. We believe pricing is reasonable at €38,000 for 10kg weight handling, with sensors implemented in all axis and easy teaching system. Given that many start-up companies were introducing cobots with, in our opinion, inferior quality and yet similar pricing (€20-40,000 per unit), we felt Yaskawa is well positioned to capture the growth of the cobot market.

3. Yaskawa sold 25,000 robots in 2015; given that 248,000 industrial robots were sold in total, we estimate that Yaskawa has c.10% market share (note these will be mainly premium robots), bringing Yaskawa’s total installed base to 350k.
Association for Advancing Automation: Machine vision and cobots excite, but be wary of buzzwords.

We hosted a meeting with the Association for Advancing Automation (“A3”), a US-based group that promotes automation industry standards and has >900 corporate members. Key takeaways were:

1. Despite the absence of a major global robotics player, the US is still at the forefront in automation. With the US robotics market growing 11% pa, US names are leaders in the embedded software and components of robots. There remain challenges when standardizing data transfer between European and US systems, and with the exception of being able to capitalize R&D costs for integrators, the US receives less grants and government incentives for automation vs. Europe and Asia.

2. Beware the buzzwords – A3 believes that some technologies are “over-hyped”. Most notably: (1) Artificial Intelligence is decades out (however, machine learning and the ability to collect and process data is improving as computational power improves), (2) Cloud computing is not feasible so long as something is safety critical.

3. They do, however, believe collaborative robots are very exciting and are quickly overcoming technological limitations (for example, citing Fiat Chrysler’s Comau is developing a faster more responsive robot to quell concerns on too low throughput). They also see increased adoption of Machine Vision, a market they estimate to be worth >$2 bn (albeit one which is currently in a bit of a cyclical downturn) where devices capable of reading in 3D cost c.$10,000.

BMW (BMWG.DE; Buy, last close €65.10): Highlighting Autos need for flexibility and continued manufacturing improvement

We visited BMW’s Welt factory in Munich which produces 10% of BMW’s automobile each year. Key takeaways were:

1. The BMW factory showcased the importance of flexibility and autonomy within leading manufacturing facilities. The factory produces 5 different models each with several major variations (left-wheel vs. right-wheel drive, convertibles etc.) and various minor ones, resulting in so many combinations that each year there is statistically likely to be only 2 cars that are the same each year (of the >200,000 produced each year).

2. While the body shop is virtually fully automated (c.99% of operations), the factory still employs 7,800 workers – largely thanks to the flexibility. The Rolls Royce engines are produced entirely by hand (although they make up max. 40 of the 1400 engines produced each day). Interestingly, the average age in the factory is 43, up from 40 a few years and expected to reach 45 soon. While this aging workforce may be partly due to a youth preference not to want to work in factories, BMW believes it is due to workers no longer having to do to strenuous work which is increasing their longevity in the industry.

3. The automobile factory is continuously evolving. BMW sees even greater products being produced in the factory and is expanding and working to improve energy efficiency, deploying technologies such as a UR cobot to perform quality checks and exoskeletons to aid works performing physically challenging tasks.
Key risks and valuation methodology

- **Teradyne Inc.** (Neutral, 12-month price target of $21.0; based 85% on 12x normalized EPS and 15% on an M&A component: 12x normalized EBITDA): Key risks to our view and price target include Semi test growth, cycle trajectory, and UR execution.

- **Yaskawa Electric** (Buy, 12-month price target of ¥1450.0, EV/IC to ROIC/WACC): Key risks to our view and price target include Yen appreciation, product mix improvement below our expectations, far lower-than-expected FA demand.

- **BMW** (Buy, 12-month price target of €80.0; EV/IC to ROIC/FMCC): Key downside risks to our view and price target include lower organic volume growth, declining consolidated China profits, and worse structural cost containment efforts together with any significant further euro strengthening.

Further reading

**Profiles in Innovation: Factory of the Future—Beyond the Assembly Line**
Manufacturing is undergoing its greatest transformation since the Industrial Revolution. A wave of intelligent technologies is shaping a more connected, flexible and efficient factory floor - and redefining the ecosystem of equipment providers in the process. In the third report in our Profiles in Innovation series, we examine the six technologies driving this transition, from “cobots” to 3D printing to the Internet of Things, and explore how it could yield more than US$500 bn of cost savings. (published April 13, 2016)
Disclosure Appendix

Reg AC

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Distribution of ratings/investment banking relationships

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