

COMPANIES

Microsoft chief clicks into industrial internet

Convergence of the IT and manufacturing sectors sees rush of venture capital as companies vie to be in at the start

RICHARD WATERS — SAN FRANCISCO

When Satya Nadella takes to the stage in Germany on Sunday for his first appearance at Hannover Messe, one of the main events in the manufacturing industry's calendar, it will signal a significant change for Microsoft.

The chief executive of the technology company admits that in past years "I wouldn't have had much to talk about — whereas now I think I have something to say".

He will not be pitching Microsoft's traditional money-earners like Office, Windows and server software, or even its newer cloud computing services. Instead, says Mr Nadella: "We are now talking about the core." This means the data being thrown off by cars, aircraft engines, elevators and other industrial products, supplying the raw material to turn dumb manufactured goods into what he calls "systems of intelligence".

Microsoft's bid to put itself at the centre of the "industrial internet of things" echoes a wider move among software companies. It suggests that the convergence of the IT and industrial worlds may finally be picking up momentum, as companies from two very different worlds fight for the upper hand.

"It's winner-takes-all," says Bill Ruh, chief digital officer at General Electric, which is also racing to stake out its position as a supplier of the foundational software to run the industrial internet. "A cloud-based platform to connect machines and build applications into it and have global scale . . . you're only going to have a few of those."

The data gathered from connected devices will create a new "digital feedback loop" that will make it possible to apply the same data science that has been developed in other fields, says Mr Nadella. This, he adds, will lead to the same "malleability and analytical power and predictive power in industrial equipment that you had in software products for the mobile web".

The result could be better controls, lower costs and new ways of generating revenue by turning hardware sales into service opportunities.

With more of the value in industrial products shifting from hardware to software, it is no surprise that many industrial companies are reconsidering their software strategies. According to GE, the industrial internet as a whole will be a \$225bn market in terms of annual revenues by 2020 — dwarfing the expected \$170bn for the consumer internet of things, which has attracted more public attention, and bigger even than the enterprise cloud computing market, which is predicted to hit \$206bn.

Of the new industrial software market, GE estimates that \$100bn will go to a small handful of companies that provide the central platforms for the industrial internet — the software that collects and aggregates data, acts as the foundation for higher-level applications and creates shop windows for developers to reach an audience in the industrial world, much like smartphone app stores.

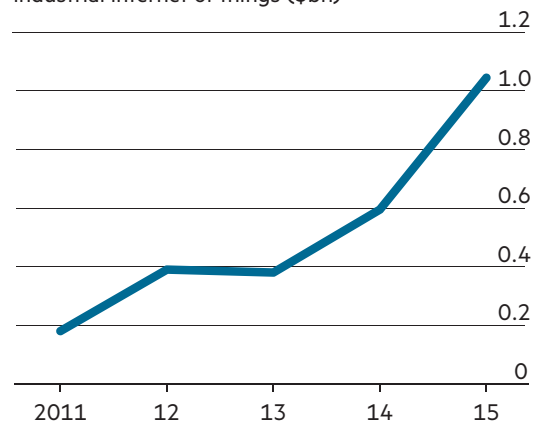
Until now, few companies have seen the business value in the data they could collect, says Jim Tully, an analyst at the research group Gartner. But he adds that asset-intensive companies such as power utilities, miners and manufacturers are finally starting to wake up to the

Net gains



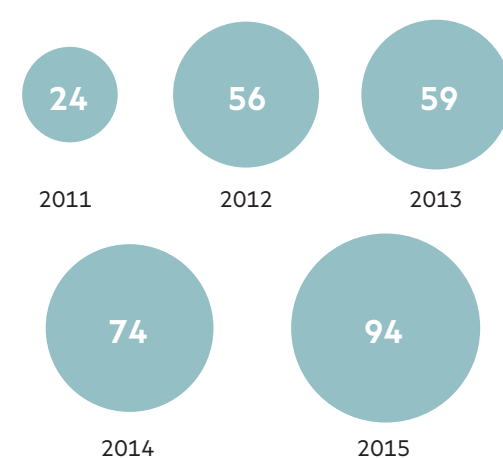
Software gold rush

Venture capital investment in industrial internet of things (\$bn)



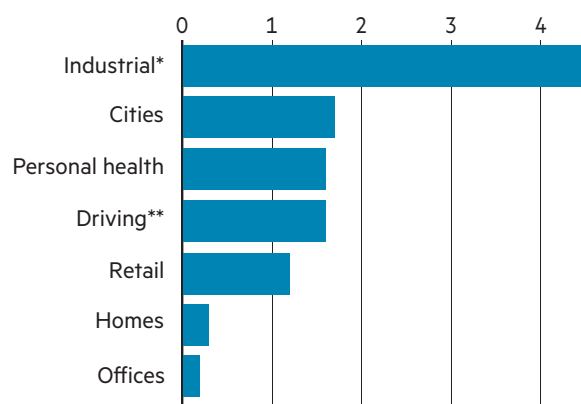
FT graphic Sources: CB Insights; McKinsey

Number of deals



Tech shift: internet of things development

Economic impact by area in 2025, high end of annual estimates (\$tn)



* Includes factories and work sites

** Includes autonomous vehicles, navigation and reduced insurance

'One person's platform is the other's app. That has played out in consumer internet, and it will play out in the industrial internet'

potential. Rolls-Royce is typical of manufacturers that believe access to different types of data are about to open up new business opportunities. The British aircraft engine maker has been collecting information about the performance of its engines for nearly two decades to help with maintenance.

Now, says Tom Palmer, senior vice-president of services, the company is pulling in other types of data about, for example, the weather. Among the goals is to help optimise flight plans for its airline customers to minimise fuel use, one of their biggest costs.

The spread of new, more flexible cloud technologies has also made it easier and faster for manufacturers to introduce new applications. GE's slow emergence as a software company highlights the problems of the old tech world. Before the cloud, building each application from scratch involved a slow and laborious process, says Mr Ruh, since GE could not call up component services it had already written for other applications.

The US industrial group has been learning from best practice in the cloud computing industry in other ways as

well. It has taken to copying consumer internet companies, says Mr Ruh, emulating everything from their datacentre technologies to their sheer speed of operations. "Amazon is one we've learnt from and watched," he says.

With the industrial internet market starting to take shape, a gold rush mentality has taken hold in the software world. Venture capital investment in companies involved in the industrial internet of things jumped 76 per cent last year, to more than \$1bn, according to CB Insights, the research firm.

"It's like eight years ago, when [cloud computing] hit," says Isaac Brown, an analyst at Lux Research. "Everyone said, 'Give me some cloud' — but didn't know what it meant."

One surprise has been the large number of start-ups vying to become platform companies rather than application providers — a risky bet given the tendency for platform software markets to consolidate. Entrepreneurs drawn to the market reject the idea that the giant software and manufacturing companies have any inherent advantage. "In most parts of the tech landscape, the entrepreneurial approach is a great formula,"

says Brad Keywell, a co-founder of deals site Groupon and a backer of Uptake, a two-year-old platform start-up. "Entrepreneurial speed is very important."

But a shake-out seems inevitable. Other new software markets created by the rise of mobile and cloud computing have already concentrated on a very small number of winners, pointing the way to what could happen in the internet of things, says Mr Ruh. He points to smartphone software, where Google and Apple rule, and cloud computing, where Amazon Web Services and Microsoft's Azure have the strongest positions, as evidence that there are only likely to be two or three winners.

GE is hoping to follow in Amazon's footsteps, copying the e-commerce group's approach of opening up the technology developed to support its own businesses for use by other companies. "We didn't take it to market until we'd built it for ourselves," says Mr Ruh.

However, GE has yet to announce it has sold its Predix software platform to any customers that compete with its core manufacturing business, and rivals claim it will be hard for the company to establish itself as a service pro-

Forging links How machinery is being connected to the web

As with most new technologies, it is the consumer uses of the so-called internet of things that have attracted the most attention. But industrial and other business applications are likely to end up being a far bigger market.

The falling price of sensors and the rise of web connectivity have made it easy to connect machinery and other objects to the internet.

Collecting the data thrown off by all the new connected objects should make it possible to monitor them more closely, optimise their performance and foresee problems. It could also support new business ideas, like charging for hardware on a subscription basis depending on how much it is used.

The industrial internet is being assembled out of four different parts, each of which has attracted a wave of investment.

One involves the billions of products and devices that will one day be connected to the internet, with companies like Electric Imp, Particle and Arrayent creating platforms to manage this process, says Isaac Brown at Lux Research.

A second focus is connectivity. Groups such as Jasper Technologies have assembled networks for handling the machine-to-machine communications on which the industrial internet will rely.

The third area of investment is in software platforms that collate data and act as a development platform for applications. Some companies also sell higher-level services like analytics to make sense of all the data being collected.

The final element consists of software applications and services, many created for specific industries. *Richard Waters*


vider to the wider manufacturing industry. Cloud computing companies, meanwhile, have been moving steadily into the industrial internet. They may lack the deep sectoral experience of a GE, but their general-purpose systems for collecting, managing and analysing data can be adapted for the purpose, says Mr Tully. Amazon announced a push last autumn, while Mr Nadella's appearance in Hannover this weekend caps a series of steps by Microsoft.

It is shaping up to be a complex new world, where software and industrial companies are likely to find themselves allies one moment and rivals the next.

Mr Nadella rejects the suggestion that Microsoft and GE will be head-to-head competitors. But he adds, of the manufacturing companies: "Some of them may have broader ecosystem agendas." Even narrow applications, if successful, can provide a springboard that puts companies at the centre of a new emerging market, he says, reflecting the restless evolution of the tech world.

"One person's platform is the other's person's app," he says. "That has played out in consumer internet, and it will play out in the industrial internet."

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