Artificial Intelligence and Robotics

Can Microsoft get back in the game with AI?

Chief executive Satya Nadella reboots corporate culture in bid to capitalise on shift to machine learning

The Big Read

© FT Graphic / Bloomberg

3 HOURS AGO by: **Richard Waters**

Microsoft is about to face its next big disruption. The world's biggest software company has come up against a series of threats over the past two decades. The internet, smartphones and cloud computing each represented big opportunities for the tech industry — while also eroding the power of the company whose PC software monopoly once made it the industry's most feared competitor.

Since Satya Nadella took over as chief executive nearly three years ago, some of the doubts about Microsoft's (https://www.ft.com/topics/organisations/Microsoft_Corp) ability to thrive in the post-

PC world (http://next.ft.com/content/a27ae4a8-9cf8-11e6-8324-be63473ce146) have lifted. Its share price has risen by two-thirds, adding nearly $200bn to its stock market value. Finally, last month, the shares edged back above dotcom peak of $58.70 (http://next.ft.com/content/72753f22-a8bf-3bb6-85e7-e18662a49bd5) at the turn of the century.

A new technology may now be ready to join the list of pioneering shifts: artificial intelligence (https://www.ft.com/artificial-intelligence-robotics). If Mr Nadella is right, it will be every bit as disruptive. But this tech revolution, he argues, is one where Microsoft is set to be in the vanguard.

“AI itself — like other democratising technologies, like the PC or the mobile phone or the internet — is going to be the next big thing,” he says.

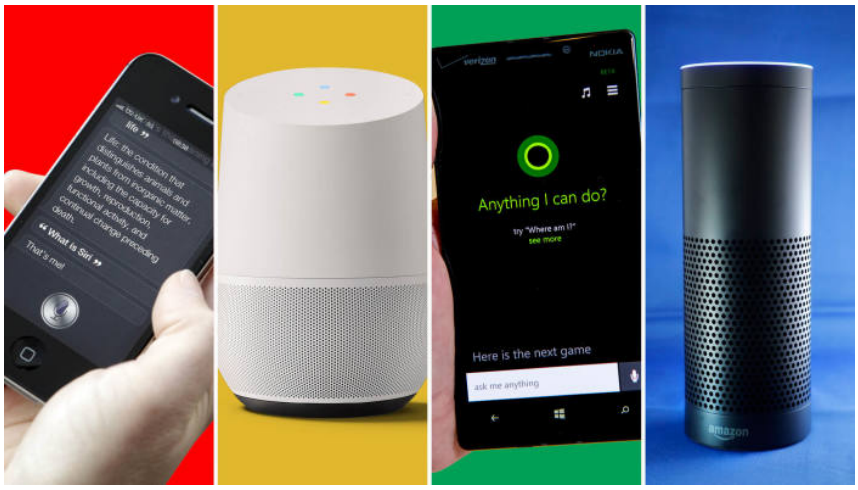
The Microsoft boss, speaking in a joint interview with the Financial Times and Nikkei (http://asia.nikkei.com/), adds: “It’s a transformative technology that changes not just computing but it changes … all walks of life, and every industry and every business process.”

His comments carry a strong echo of the prediction by co-founder Bill Gates, some 20 years ago, that the internet would “change everything”. The sweeping nature of that claim was criticised at the time as unjustified hyperbole. But it hardly looks excessive in retrospect.

With machine learning — the technology behind recent advances in AI — “every human interaction [with technology] is going to be mediated by the fact that we can create intelligence by reasoning over large amounts of data”, says Mr Nadella.

AI is “the thing that is going to be in the internet,

it’s going to be in every device”, he says. “Every product we design, and how every user is going to interact with the environment, is going to be ‘intelligence first’.”



© FT Graphic

Apple | Siri Launched in 2011, the voice-activated assistant handles 2bn interactions with users a week

Amazon | Echo The ‘smart speaker’ uses AI to respond to a range of voice requests, including online purchases

Microsoft | Cortana Installed in Windows 10, it is used by 105m people a day and now appears in app stores

Google | Allo The smartphone messaging app includes an interactive assistant

Cloud and mobile computing have been the twin forces driving the tech industry for 15 years. Together, they have brought a pervasive new computing platform, bringing huge processing and data-gathering power to billions of handheld devices. Mr Nadella says AI will be more than just the cherry on top — it will be the whole cake.

His claims come at the end of a year in which AI has become the tech industry’s most vaunted new

thing. Early this year, Mr Nadella declared that "conversational computing" — the ability to talk to machines — was set to be the next big computing breakthrough, with voice-activated "intelligent agents" (http://next.ft.com/content/f78fd0bc-8163-11e6-8e50-8ec15fb462f4), like Microsoft's Cortana, taking on the role that browsers played in the desktop era.

There is still a yawning gap between the promise and the reality. A Microsoft chatbot called Tay (http://next.ft.com/content/8ba60bc4-f1c0-11e5-aff5-19b4e253664a) revealed the pitfalls of machine learning this year when the humans it was conversing with over Twitter taught it to spout racist comments. It was taken offline in March.

Tim Tuttle, chief executive of MindMeld, another company working on conversational computing, says chatbots have been one of the disappointments of 2016. He credits Microsoft with making "steady progress", but claims that it will still take years for the company's technology to evolve far enough for customers to easily build "advanced bots" of their own.

So-called enterprise customers — the big corporate and government buyers that make up the bulk of IT spending — are also likely to move slowly, whatever the big claims made for AI.

"It will take time for enterprises to ask what this means for them. It's a slow transition," says Rob Sanfilippo, a former Microsoft program manager, though he adds that with Mr Nadella's push into AI, "there are billions of dollars being invested and some great computer science going on".

Microsoft spent $12bn last year on R&D, a third more than Google. A large slice of that budget is now being swung behind AI. A third of the work

being carried out in Microsoft Research is already spent on AI-related projects, the company says, and Mr Nadella sought to reinforce this in September by putting Harry Shum, one of the company's top AI experts, in charge of a new group comprising more than 1,000 of the company's researchers and 5,000 engineers working in the field.

Getting AI on the cloud

The Microsoft chief executive has not been alone this year in putting machine learning at the centre of his plans. Sundar Pichai, his counterpart at Google, has said the technology is being used to remake all of his company's services, while IBM (http://markets.ft.com/data/equities/tearsheet/summary?s=us:IBM) has bet its future on a collection of AI and data analytics it sells under the brand name Watson (http://next.ft.com/content/dced8150-b300-11e5-8358-9a82b43f6b2f). Amazon (http://markets.ft.com/data/equities/tearsheet/summary?s=us:AMZN), Facebook and Apple (http://markets.ft.com/data/equities/tearsheet/summary?s=us:AAPL) have all been boosting their AI capabilities, while Chinese search company Baidu (http://markets.ft.com/data/equities/tearsheet/summary?s=us:BIDU) has made impressive advances of its own, particularly in speech and image recognition.

IBM's Watson computing system at the launch of a Man v Machine competition in 2011 © Getty

The deep technology expertise, and the computing infrastructure needed to deliver AI as a cloud service to customers around the world, will limit the number of companies able to compete, says Mr Shum. He predicts this new tech race will leave only a handful of winners — "probably five, plus a couple of Chinese companies".

But when it comes to grabbing popular attention, Microsoft's name has not been at the forefront. The limelight has been hogged instead by Google, whose Deep Mind division this year beat the best human player at Go, a game seen as the most challenging for both human and computer brains. IBM's marketing success with Watson, meanwhile, has strengthened that company's AI reputation among corporate customers.

Nor does Microsoft have the smartphone platform that can put its AI into the hands of a mass consumer audience, as Apple has done with Siri, or Google now hopes to do with its own new intelligent agent. Even Amazon's Echo, a "smart speaker" that responds to voice commands, has generated more industry buzz than Microsoft's Cortana.

This clearly rankles inside the company. Eric

Horvitz, one of its top AI experts and head of the research lab at its Redmond headquarters in Seattle, says “there is definitely opportunity to communicate better”.

Battle for control: Go grandmaster Lee Se-dol loses to Google's AlphaGo in March 2016 © AFP

Mr Nadella concedes that Microsoft has little presence in “AI that is there either in a speaker or on a phone”. But with 105m people a day using Cortana, which is embedded in the latest version of Windows, he says the company does better when it comes to larger screens — what he calls “AI attached to glass”.

Microsoft is counting on its network of data centres — and its cloud computing platform, called Azure — to bring its AI technology to a broad corporate market. This includes a suite of services that companies can “plug” their own data into, such as an “emotion” interface that examines pictures of faces to automatically detect a person’s feelings.

Tools like these, made available through the cloud, are part of a new approach that is very different from Microsoft under Mr Nadella’s predecessors, Mr Gates and Steve Ballmer, says Mr Sanfilippo, who is now an analyst at Directions on Microsoft, a research group that tracks the company. It is “an example of the

Nadella era — more open and community-minded", he says.

Microsoft's old ways of working — building and shipping software products on predictable schedules, working in strongly independent divisions — are not suited to what lies ahead.

According to Mr Nadella, the AI era is forcing Microsoft to think more deeply about the impact of their technologies on the world. AI, he says, will profoundly affect people's lives. "It may define 'How safe is my car? How healthy am I going to be?' It's just so much more mainstream," he says. "The responsibility of our industry is no longer just, 'Hey, here's a new device, go enjoy it'."

Besides involving tech companies in new ethical judgments, this will require breaking out of their old product-centric ways to develop what he says is a more "human-centric" approach.

Mainstream research

This will make AI the biggest test for Mr Nadella's efforts to remake Microsoft's culture. Under Mr Ballmer, the company was often criticised for getting tangled in internal bureaucracy and battles between warring fiefdoms. Often, it was the powerful Windows division that won the day, as leaders of other businesses were forced to adapt their plans to support the biggest money-earner — a drag on innovation some former executives referred to as the "Windows tax".

Related article

AI academic warns on

The current CEO is careful

brain drain to tech groups (http://next.ft.com/content/298e2ac0-b010-11e6-a37c-f4a01f1b0fa1)

Poaching of artificial intelligence talent could set back research, says Yoshua Bengio

not to refer directly to

Microsoft's internal struggles, but does say that the failure to bridge internal divisions is "the classic thing" that holds companies back. The recent reshuffle to create a new AI and research group under Mr Shum is a sign of this attempt to break down barriers inside the company.

But Mr Nadella himself dismisses the idea that simply shaking up the organisation will be enough. "It's not about: 'Oh, let's do a reorganisation'," he says. Instead, it will take a cultural change that requires looking past product and technology boundaries so that "respect for old category definitions" fades.

Mr Nadella says he has been working to embed a new "cultural meme" in the company — something he calls a "growth mindset" — to make the company more flexible. He credits Carol Dweck (https://www.ted.com/talks/carol_dweck_the_power_of_believing_that_you_can_improve), a professor of psychology at Stanford University, for shaping his thinking. This cultural

change, he adds, is “the existential thing” that will determine Microsoft’s fate.

The rise of AI will also be a test of the company’s ability to move faster. Under Mr Nadella, it has moved to a new style of agile software development that involves making more continuous, incremental changes.

Microsoft executives certainly talk about AI as a work in progress, not a finished product. It is also likely to take years to realise the full potential of the technology. Mr Shum predicts the AI wave will take two decades to play out, throwing up new products and services that haven’t been thought of yet. “I don’t think it’s going to be just one problem, just one signature product. I think it will be many, many things,” he says.

Coming up with those breakthrough ideas will be a key test for the new, boundary-less Microsoft that Mr Nadella has been trying to build.

Basic research: Bill Gates’ vision behind decades of AI work

As it gears up for the artificial intelligence wars, Microsoft has some powerful assets to call on, starting with basic research. The US technology group began investing in fields related to AI years before companies such as Google were even dreamt of, setting up Microsoft Research in 1991. The first fields the company explored were natural language understanding, speech recognition and computer vision.

Eric Horvitz, head of the research lab at its Redmond headquarters, says it was

Bill Gates' goal of "building computers that one day can see, hear and understand human beings" that led him to Microsoft when he left college in 1992.

Though rivals such as Google and Facebook have gained more attention with hires of some of the top academic experts in deep learning, a field where the biggest breakthroughs in machine learning have been made, Microsoft's investments have helped to put it on the leading edge of the technology. Last month, it claimed to have become the first to match humans in speech recognition.

Other Microsoft investments have played important parts in extending its AI capabilities. By crawling the web, its Bing search engine has supplied massive amounts of language data needed to train translation algorithms.

The bet on AI is also reflected in investments in Microsoft's global network of data centres. It disclosed recently that it has been including specialised chips, known as field programmable gate arrays, in all new servers in its datacentres.

FPGAs increase the amount of data the servers can process — a requirement for machine learning — but also leave the flexibility to make big changes in algorithms without needing to overhaul the hardware, says Doug Burger, a Microsoft engineer.

Latest on Artificial Intelligence and Robotics

Smart Money

Do you want to hand your money to super-algo or a Swiss banker?

Artificial intelligence expert seeks to dismantle some popular assumptions

Review **Black Friday**

A technology gift guide for Black Friday

From Amazon's Echo to the PlayStation VR, here's a Christmas list of top products

The Big Read

What role for the workers in Trump's American factory revival?

Greater automation means restoring manufacturing jobs will prove a hard pledge for the president-elect to fulfil

Follow the topics mentioned in this article

Opinion

The Big Read

Alphabet

Microsoft Corp

Apple

Follow the authors of this article

Richard Waters

Take a tour of myFT

Latest in Opinion

Anjana Ahuja

Reporters' notebook

Conscription, the secret

Plaques, tangles and the mystery of Alzheimer's disease

Dementia affects many millions but a cure is as elusive as ever

3 HOURS AGO

behind Israel's new army of geeks

Notebook: Other countries can learn lessons from these twentysomething veterans

3 HOURS AGO

Special Report **Investing in Turkey**

Could Trump trample Turkey's growth?

The implications of a Trump presidency are likely to be dire for the Turkish economy

4 HOURS AGO