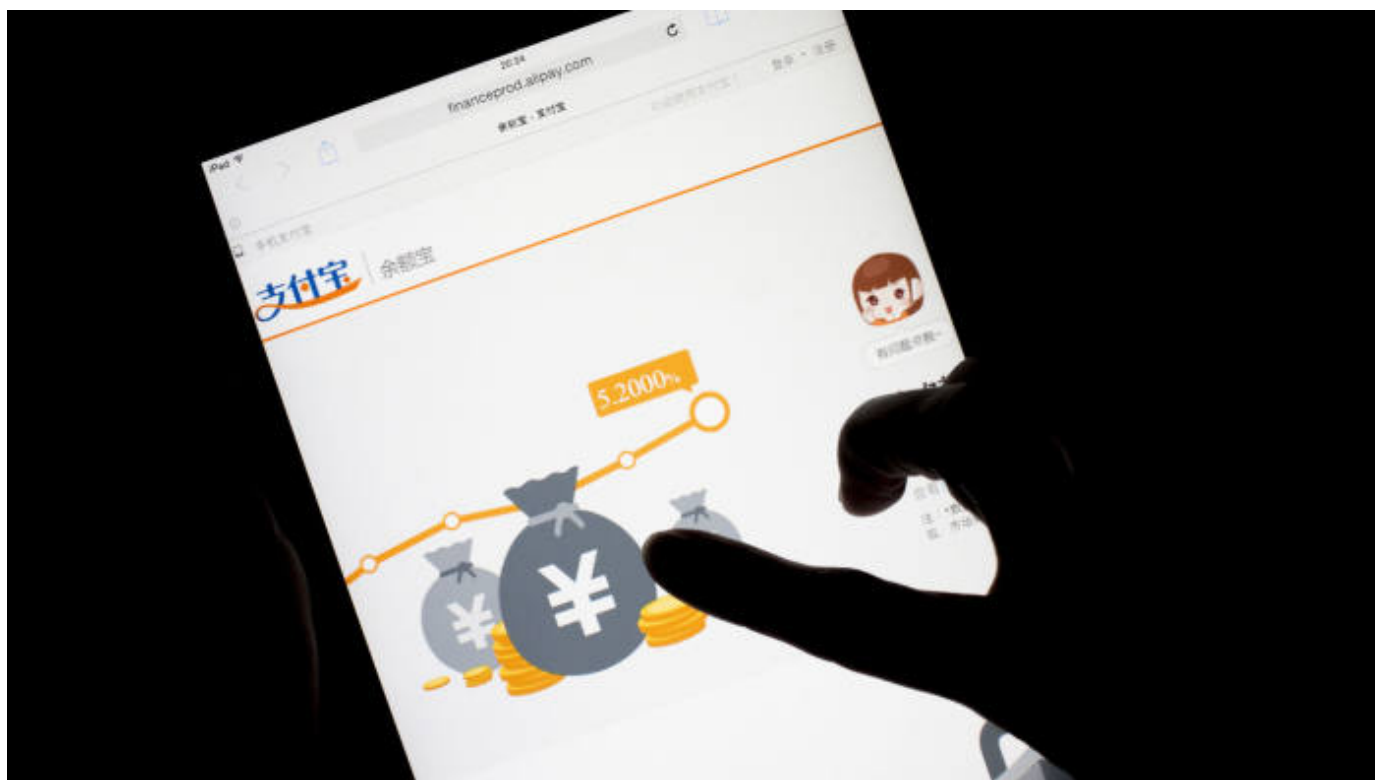Opinion **Innovation**

Three technological trends that will shape the decade

China will reinvent finance while computing power grows and genome sequencing becomes cheaper

JOHN THORNHILL

© Brent Lewin/Bloomberg

John Thornhill 6 HOURS AGO

The new year has already brought a spate of eye-catching events. Expect this year's headlines to be dominated by conflict in the Middle East, insurgency in Hong Kong, Brexit and the re-election (or not) of US president Donald Trump.

Trends, on the other hand, tend to be slow, incremental and harder to grasp. But, as the historian Fernand Braudel argued, trends determine events. Here are three technological trends that I think will shape this decade.

First, Chinese technology will reinvent finance. In the west, investors are excited about fintech, as finance and technology converge to deliver familiar services more efficiently. In China, it might be more accurate to describe the process as techfin: technology is completely redesigning finance from the smartphone user's perspective. Call it late-mover advantage.

The speed at which China has moved from a cash to a digital-payments economy is staggering: some $17tn of transactions were conducted online in 2017. China's mobile payment volumes are more than 50 times those in the US.

That growth has been chiefly driven by two tech companies: Alibaba and Tencent. To facilitate payments on its ecommerce platform, Alibaba created an e-wallet, which fuelled the extraordinary growth of Alipay and temporarily created the world's biggest money market fund.

Rival Tencent developed its financial business, WeChat Pay, off the back of its messaging and gaming apps. It now has 900m users. Both companies still have room for growth in rural China. But perhaps the most enticing opportunities lie abroad. About 1.7bn people in the world remain unbanked. When they come online they will be looking for cheap, convenient, integrated digital financial services, such as China has pioneered. China has the chance to rewire 21st-century finance.

The second trend is the growth of computing power. The limits of physics are now restricting the number of transistors that can be stuck on a silicon chip, threatening to break Moore's law, which observes that processing power doubles every two years. That does not unduly worry the computer industry and should not degrade user experience — as long as engineers become more innovative in other ways.

The shift of computing to the cloud and the "edge" (think on-device smartphone apps) has created new architectures of connectivity. The expansion of 5G networks will result in far richer data exchanges. Breakthroughs in specialist chip design and quantum computing may also lead to different ways of delivering improved results. But perhaps the most intriguing trend is how quickly software will improve.

Marc Andreessen, the US entrepreneur and investor, says software programmers have had an easy ride for decades thanks to Moore's law but must now raise their game. "Software today is massively inefficient," he said on a recent podcast. "It's become prime time again for software programmers to get really good at optimisation." This was already happening, he said, in artificial intelligence and cryptocurrencies. Can Moore's law in effect "flip" from hardware to software, as Chris Bishop of Microsoft Research has speculated?

Third is the collapsing cost of genome sequencing. Just as computer hardware has been transformed by Moore's law, so the pharmaceutical industry has been hobbled by Eroom's law (Moore spelt backwards). This observes that drug development has become significantly slower and more expensive, partly because most of the simple stuff has been discovered.

But the extraordinary collapse in the cost of genome sequencing could open the way for personalised medicine. The National Human Genome Research Institute estimates that the cost of sequencing a human genome fell from $14m in 2006 to about $1,000 a decade later. A target of

less than $100 now appears achievable. As many as 2bn people are forecast to have their genome sequenced by 2025. As a result, we may increasingly move from being biological rule-takers to rulemakers. That trend has some scary ethical dimensions but holds out remarkable promise for the treatment of certain diseases.

All technological predictions remain subject to yet another rule, Amara's law, which states that we overestimate the effect of many technologies in the short run but underestimate them in the long run. It is often easier to predict what may happen than when. For that reason, no one can make any incontestable claims about what impact these trends will have by the end of the decade. But it will certainly be fascinating to find out.

john.thornhill@ft.com

Follow John Thornhill with myFT

FT Opinion

Catch up with the latest opinion articles from the Financial Times by subscribing to our FT Opinion email newsletter. Sign up here for your daily guide to today's debates.