Words Nick Scott

Special report

BLOCKCHAIN: THE INTERNET'S SECOND GENERATION

It first came to prominence as the technical innovation behind cryptocurrency bitcoin. But why is blockchain – a digital, peer-to-peer ledger that records transactions in real time with ruthless accuracy – now set to change the way we do business far beyond the world of finance? *Director* asks the experts...

"You wouldn't steal a car," flashes the caption in the anti-piracy advert that you may recall from the days of watching DVDs. "You wouldn't steal a handbag. You wouldn't steal a television." The flaw in the ad's reasoning, of course, was that many who wouldn't dream of purloining someone's physical property would not think twice about downloading a copy of a Ferrari California, a Hermès Birkin or a 55in smart TV, were it possible to do so without the rightful owner being deprived of their original prototype.

This is a quandary that has stumped the finest minds in the IT industry for decades: while replicating information digitally is all very well, reproducing things of actual monetary value is extremely problematic. And while 3D printing has some way to go before we can start cloning Ferraris, the problem is a pressing one when the focus turns to other units that are worth something – and we're not just talking about digital piracy.

"When it comes to things like assets, money, stocks, bonds or anything that has real value, sending a copy is a really bad idea," explains Alex Tapscott, CEO and founder of Northwest Passage Ventures and co-author of the recently released book *Blockchain Revolution: How the technology behind bitcoin is changing money, business, and the world*. "If I send you $20 (£15) in payment for something, it's important that you know you have it and, crucially, that I no longer do, and that I cannot send that same $20 to every other person I know. That would make the $20 worthless, and the system wouldn't work. So while it's great to have an online printing press for information, it's not for money."

The current solution to this predicament – referred to as the "double spend problem" by computer scientists – is to have intermediaries such as banks, technology firms and governments administer every aspect of transactions, from identity issues to trust creation between parties via processing, settlement and record-keeping. But what if there were another way – a quicker, more secure, less complex and cheaper way?

"What if there were a vast distributed network, based on the principle of a ledger, that wasn't just run on one single computer, like a bank system or a government database, but on every computer all around the world?" says Tapscott, who was a keynote speaker at a blockchain summit on Sir Richard Branson's Necker Island in June. "And on this network are things that have real value: money, stocks, titles, deeds, financial assets of every kind, intellectual property, even votes in an election, all moved and stored and managed peer-to-peer?" Enter, stage left, blockchain – the disruptive technology which Tapscott believes represents "the second generation of the internet".

The crypto factor

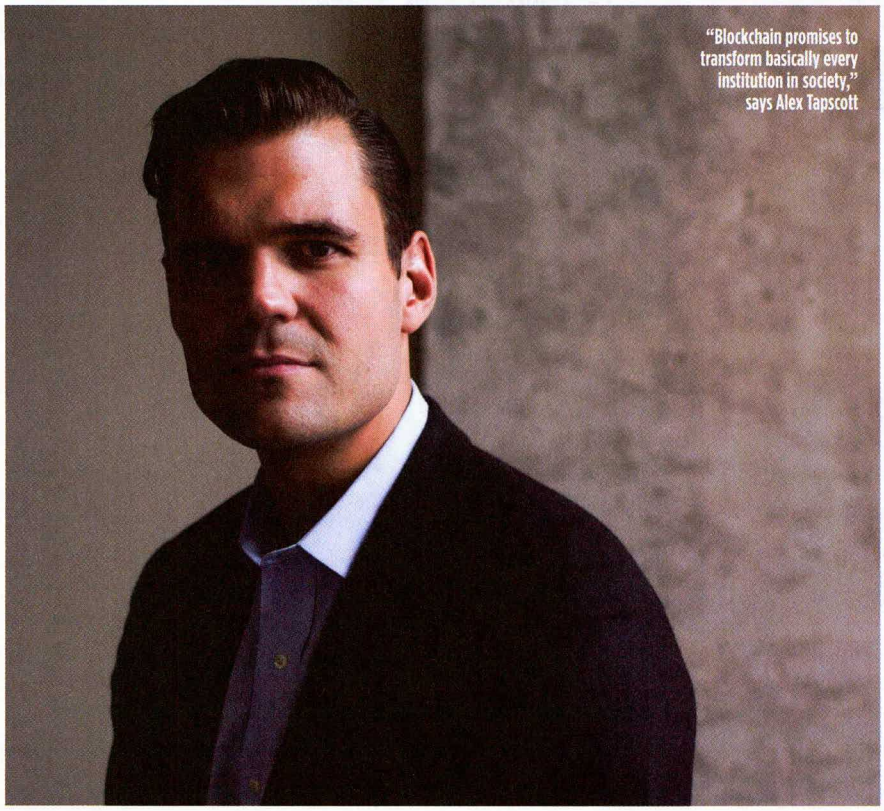
While the practice of keeping ledgers goes back centuries, blockchain's story really begins in 2008, when an anonymous person or group of people under the name 'Satoshi Nakamoto', published a white paper which posited an electronic peer-to-peer cash system. They called it bitcoin. The resulting 'cryptocurrency' meant that, for the first time in human history, two or more parties could transact online without a third party involved, using a currency that was not issued, owned or controlled by any government – or intra-government – organisation.

Bitcoin has since endured several controversies – not least in 2013, when the FBI seized 144,000 bitcoins, then worth around £18m, from the owner of the Silk Road online drug emporium. But the number of retailers accepting the bitcoin passed the 100,000 mark early last year, and Tapscott estimates the bitcoin blockchain to now be marshalling anywhere between 10-100 times as much computing power as all of Google's server farms put together.

So why is the blockchain concept only poised to permeate every nook and cranny of the business scene today? Why has it failed to achieve such ubiquity earlier? In part, it is because the technology has only just reached the requisite level of maturity for widespread, mainstream use. The mechanics aren't simple: they involve digital records being lumped into 'blocks', tied up cryptographically and chronologically into a 'chain' by dizzying algorithms, then being verified independently all around the world before being given a digital signature.

"It's like most tech cycles," explains Nick Williamson, CEO and founder of »

"Blockchain represents, for business leaders, the first digital medium for value, and promises to transform basically every institution in society" Alex Tapscott, Northwest Passage Ventures



"Blockchain promises to transform basically every institution in society," says Alex Tapscott

Credits – a 'built-from-scratch platform for creating custom, interoperable blockchains', as the company describes itself. "If you look at other technologies that have come about in the last decade and revolutionised the way we conduct business – smartphones and the cloud spring to mind – you get people in the tech sector saying, 'well, we thought of that in 1970', but what happens is that an inflection point is hit: one that makes a technology small enough, fast enough or usable enough to be fit for purpose for a broader audience."

Now that the technology is ready, the problems it solves are so acute that employment of blockchains is widely deemed urgent. "The sheer expense of running ledgers has become so great that change is inevitable," says Peter Randall, founder and CEO of Setl – a blockchain start-up launched in July 2015. Randall believes that elimination of intermediaries is a natural effect of technical progression – changes to our telecoms systems, for example ("no one calls an operator any more and says 'Kindly connect me with Mr Randall, please'") and, more recently, supermarket transactions ("they've subbed the checkout job to you – you've become the cashier").

But it's the sheer cumbersomeness of the status quo, he says, that will make blockchains a commercial omnipresence in the not-too-distant future. "A multiplicity of ledgers means a multiplicity of complexity. A lot of that complexity, and therefore expense, can be eliminated. People have begun to realise that competition is about providing great service to customers, and that is much more easily provided when all the records are in a single, sensible, accessible place."

Tapscott agrees that the present situation's failings are the fiercest wind in blockchain's sails. "Overall, payment intermediaries do a very good job, but they have limitations," he says. "Firstly, they're all centralised, meaning they're vulnerable to hacking or attack. Secondly, they capture your data – they know what you've bought, where you bought it and so on, and that kind of information can be used to undermine your privacy. Thirdly, it slows things down – it can take five to seven days just to make a cross-border payment, which is ridiculous. And, all parts of commerce or business online are costly – overseas payments can cost up to 10 per cent. You can argue that these intermediaries capture more of the value – the value that's been generated by the first generation of the internet – than they deserve."

But what of security, you might ask? Surely any blockchain is open to mendacious tampering? Well, the system's inherent security relies on hordes of people referred to as 'miners' verifying chunks of transactions in return for payments, using mathematical formulas. Once they've reached a consensus on any given block, it is added to a chain of blocks that goes back to the beginning of time, and the information held in each block must correspond to the preceding one in order to be valid.

As a result, Tapscott says, tampering with a blockchain is a momentous undertaking. "Every transaction is time-stamped. If I wanted to sell the same stock twice, or vote twice in an election, or duplicate the IP rights to a song and share it twice I couldn't just tweak one entry. I'd actually have to rewrite the entire history, all the way back to the beginning of the blockchain. And do so in the broad daylight of the largest computer resource in the world, and in a 10-minute window." In other words, meddling with a blockchain would be like trying to tamper with a fraction of a tapestry – for the full picture to remain plausible, you'd have to reweave the whole thing.

Start-up opportunities

It's secure, it cuts costs, reduces delays and it's brutally efficient – no wonder blockchain start-ups are proliferating. So far in 2016, across the Atlantic, Deloitte, JPMorgan and State Street have all seen members of their blockchain teams depart, in favour of lesser-known entities such as DPactum, Kadena and Nuco. Minnows they may be, but these companies don't lack ambition – in August, another American start-up launched in September 2015, R3 CEV, filed a patent for its plans to build an entirely new Wall Street infrastructure using bitcoin technology.

In the UK, the Financial Conduct

Authority has announced that it is considering approving a "small but significant number of [blockchain] firms", while Randall describes Britain as having "exactly the right legislative and legal environment, the right financial structures and now the right backing for financial services technology to make it the perfect place for [blockchain] companies to thrive". It's also telling that very big players from the financial scene are getting involved (blockchain start-up Setl has board members including Rachel Lomax, former deputy governor of the Bank of England and Ed Richards, former CEO of Ofcom; its chairman is former Barclays chairman Sir David Walker).

Demonstrating blockchain's vast range of potential applications, London-based start-up Provenance has just completed a successful pilot project in Indonesia, which saw tuna fish committed to a blockchain in order to prove how this technology can greatly increase transparency in global product supply chains. "In the grand scheme it's still early days in the development of blockchain technology and its wider utility, and the next couple of years will see the design and business cases for the technology come into real fruition," the company's founder, Jessi Baker, tells *Director*. "So businesses and individuals will start to engage with it for a huge variety of things."

Blockchain, Baker believes, has the potential to be almost as disruptive as the internet itself. "The ability to share data in a trusted format without needing a third party will be huge for transactions of all kinds. Adopting the technology now could provide a huge early advantage to businesses as well as saving them time and money from the get-go."

Tapscott agrees, particularly in light of the potential, now, for smaller companies to harness blockchain without developing it themselves (Setl has recently released OpenCSD, a payment and settlement platform available for companies of all sizes to use).

"We think that this could be the beginning of the halcyon days of entrepreneurship for small companies, because they can do so much more with much less by using this technology," he says. "Blockchain represents, for business leaders, the first digital medium for value, and promises to transform basically every institution in society. We've moved from an internet of information to an internet of value."

Alex Tapscott's book, *Blockchain Revolution: How the technology behind bitcoin is changing money, business, and the world*, is out now (Portfolio Penguin, £14.99)

Watch a video of Alex Tapscott discussing the blockchain revolution at **director.co.uk/blockchain**

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BLOCKCHAIN IN NUMBERS

£15bn The approximate amount of global GDP, 0.025%, held in the blockchain

£750m The amount global financial institutions will spend on blockchain in 2016, according to a recent estimate from Greenwich Associates

£525m The fortune the mysterious bitcoin creator was believed to be sitting on in June 2016

18 months The period Visa spent, up to September 2016, investigating blockchain's potential, according to a report in the *Financial Times*

4 The number of the world's biggest banks – Deutsche Bank, BNY Mellon, UBS and Banco Santander – involved in a plan, announced in August, to develop a system to enable financial markets to use blockchain technology

FIT FOR PURPOSE?

Peter Randall, founder and CEO of Setl, on the five criteria a blockchain must fulfil

Speed
"Some companies – a mobile-phone company, perhaps – will be doing tens of thousands of transactions per second, so it's got to be able to be capable of that."

Capacity
"If you're a large bank, the quantity of records that needs to be processed and stored is going to be vast."

Identity
"You've got to be able to operate this in what we refer to as a 'permissioned environment'. You've got to know where the processing's done, who's responsible for it and how it happens."

Currency
"It's also got to operate in real-world currencies. People want to be paid in sterling, euros or yen."

Openness
"You've got to be able to talk across borders and chains. Take mobile phones – I can go to the US and call you in Japan or Australia and call you both using our +44 numbers."