SPECIAL REPORT

Raiders of the killer dapp

Blockchain technology may offer a way to re-decentralise the internet

Startups want to remake the internet with blockchain

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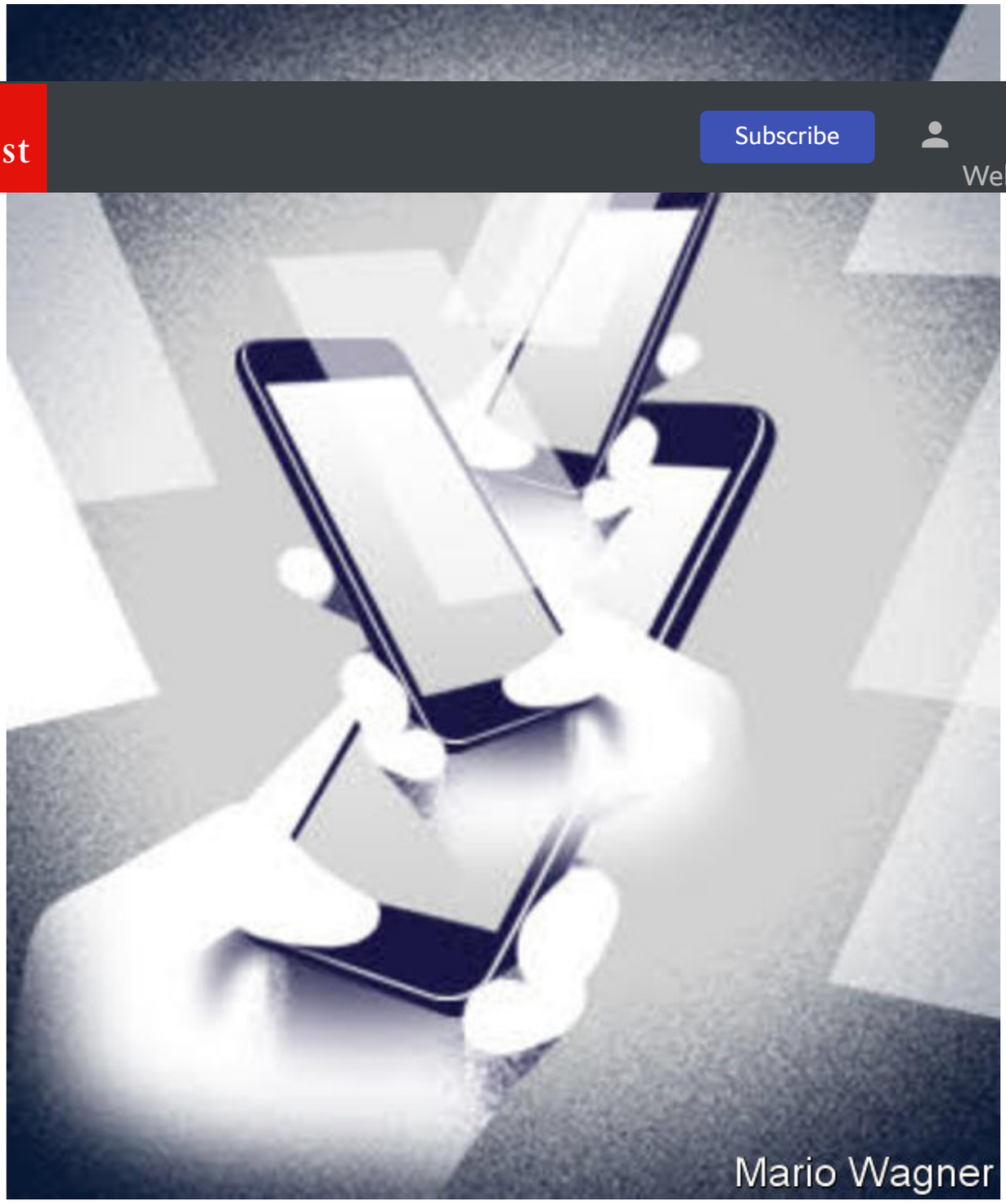

WHAT MASS IS for Catholics, technology conferences are for geeks. Speakers at these gatherings often sound like preachers, promising a dazzling future. So it was at a blockchain conference

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have recently launched new crypto-currencies via an initial coin offering (ICO), a much-hyped form of crowdfunding. But though Blockstack and its ilk have done the same, their main aim is to use technology to make the online world a more decentralised place where people can do business "on their own terms", in the words of Ryan Shea, co-founder of Blockstack. Again, this sounds like the sort of thing geeks said in the 1990s. Will this generation succeed where the previous one failed?

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It will not be easy. To achieve their objective, they will have to overthrow an existing digital regime, called Web 2.0, that is still going strong. But it seems to be a feature of information technology that every few decades its most profitable part becomes commoditised. In the 1970s the microprocessor radically reduced the cost of computers. In the 1990s open-source software started to dethrone Windows, Microsoft's then-dominant operating system. Now it is the turn of data, predicts Joel Monegro of Placeholder VC, a venture-capital firm set up to bet on the trend.

You can check out, but you can never leave

Today online applications bundle user interface, code and data. Facebook, for instance, is best known for its website and app, but both are just the tip of a virtual iceberg: most of the software and all the information that keep the social network going lives in the firm's cloud. Controlling those data gives these companies power. Users are free to move to another service, but they would lose all that information, including the links to their friends. By contrast, in the new world of Web 3.0 (or Web 3, for the truly initiated), interface, code and data are meant to be kept separate. This would allow power to flow back to users, who could decide which application can access their information. If they were not happy with one social network, they could easily switch to another. With such decentralised applications, or "dapps", users could also interact directly with other users without an information-hoarding intermediary in the middle.

To be sure, similar ideas have been tried before—and failed. Decentralised services, then called "peer-to-peer", briefly flourished in the late 1990s and early 2000s. They fizzled out mainly because no one knew how to build a robust decentralised database. That changed in 2009 with the invention of Bitcoin and the blockchain, the technology that underlies the crypto-currency. In essence, it is a ledger without a centralised administrator, maintained collectively by some of its users, called "miners", who also protect the blockchain and keep each other in check.

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Though these days Bitcoin is mostly used to speculate, the crypto-currency can be seen as a dapp. The blockchain is a specialised database in the form of an immutable record of the transaction history of every bitcoin in circulation, which makes it clear who owns what. Holders of the currency use a piece of software called a "wallet", essentially a browser for the blockchain that carries the necessary cryptographic keys, to keep track of their assets and transfer money.

Almost all Web 3.0 projects borrow heavily from Bitcoin and Ethereum, another blockchain that comes with "smart contracts", snippets of code that encapsulate business rules which are executed automatically if certain events occur. The most advanced projects focus on building the software infrastructure needed for dapps. Blockstack, arguably the most ambitious, is best seen as an operating system for such applications.

Another field of much endeavour is decentralised digital storage. One such effort is Solid, a project led by Sir Tim, which features individual "data pods" where people keep their information (though it does not use blockchain technology). Another is the InterPlanetary File System (IPFS), the brainchild of Juan Benet, a co-founder of Protocol Labs, a startup.

Actual dapps are still few and far between. Graphite, which runs on Blockstack, is a bundle of online word-processor and other office applications, much like Google's G-Suite. OpenBazaar, which relies on IPFS, is an alternative to Amazon. There is no central server to list what is on offer and to process transactions; instead, buyers and sellers download software that can settle things directly between them. The most popular dapp so far is a game called CryptoKitties, a marketplace for digital pets that lives on the Ethereum blockchain.

Building the right tools and applications will take time, but it is not the hardest part of decentralisation. Plenty of institutional innovation is also needed. If blockchains are to manage without central administrators, others will have to handle the task. These could be miners, but also developers and operators of "nodes", computers that keep copies of the blockchain. Web 3.0 projects are often like mini-economies, with a currency and a governance system. And project leaders, though often of a libertarian bent, have no choice but to become regulators.

Previous efforts at decentralisation also foundered because the economics proved wanting, including those of the original internet. Historically, most protocols were developed by researchers and then maintained by non-profit organisations. But when the internet went mainstream and the money poured in, things got more complex. Commercial interests made finding consensus more difficult, and engineers preferred to join fast-growing internet companies building applications. Besides, incentives to adopt new protocols were lacking. So they became the poor relation of the internet, whereas applications thrived, explained Mr Monegro, the venture capitalist, in an influential blog post, "Fat Protocols", in 2016. With Web 3.0, he says, it will be the other way round.

Again, Bitcoin pointed the way. Satoshi Nakamoto, its elusive inventor, also designed what is now called a "crypto-economic model". Miners are promised a monetary reward for their number-crunching work. Details aside, every ten minutes they participate in a lottery. The winner gets the right to update the blockchain and a small number of bitcoin. The reward gets paid out only after a dozen more lottery rounds, so it is in the winner's interest to keep the system ticking.

Many Web 3.0 projects have developed their own crypto-economic models. The idea is to replace a centralised firm with a decentralised organisation, held together by incentives created by a token—a kind of "crypto-co-operative". All those involved, including the users, are meant to have a personal stake in the enterprise and get their fair share of the value created by a protocol.

Having kittens

Some models are just intended to create a thriving marketplace, which in the case of CryptoKitties means you can buy, sell and breed them for monetary rewards. Other projects are more ambitious. Filecoin, too, is meant to be a marketplace where digital storage space will be exchanged for an eponymous digital token. To keep it flowing, the project, also founded by Protocol Labs, has resorted to much economic engineering. A complicated mechanism matches supply and demand.

The most elaborate working crypto-economic model, however, is

Steemit, an online forum which rewards its 1m or so registered users for posting contributions or rating content with real money in the form of steem, another sort of token. One type is liquid and can be cashed out using an exchange, which is meant to provide near-instant gratification and attract users. The other, called "steem power", is less easily convertible and supposed to keep members engaged: the more they own, the more weight their votes have.

If this sounds complicated, the bylaws of these crypto-co-operatives can be even more so. Once more, Bitcoin is a good place to start, although in this case as an example of how not to do it. When the mysterious Mr Nakamoto disappeared in late 2010, he did not leave behind any governance mechanism to speak of. Only a rudimentary one has been put in place since. Bitcoin developers agree to changes to the system's software, which miners then implement in what amounts to a vote by computing power. But in recent years the two groups have been at loggerheads over how best to increase Bitcoin's capacity. As a result, several factions have already created their own version of the currency. Ethereum is now running into similar problems.

To avoid such difficulties, some newer blockchain projects are planning to hardcode their decision-making processes into the software in the form of smart contracts, a method known as "on-chain governance". Tezos, for instance, calls itself a "self-amending ledger". It allows anyone to propose changes which are then voted on. Winners get some tokens as a reward. Polkadot, for its part, is planning to write a "constitution" into its "genesis block", the anchor for every distributed ledger. Token-holders will be able to vote on changes to the system. But there will also be a "constitutional court" which can override decisions.

Web 3.0 projects need to solve a number of practical problems before they can truly take off. Bitcoin, again, helps illustrate the hurdles. Chief among them is what crypto-buffs call “scalability”, meaning that blockchains are currently not able to deal with large numbers of users. Bitcoin’s capacity is higher than it was, but the maximum is still about ten transactions per second, compared with the thousands that a centralised payment system can handle. Newer blockchains do better, but are unlikely ever to beat centralised databases.

Moreover, many blockchain projects are themselves quite centralised. Almost all bitcoin mining happens in China and is controlled by a few firms (although the government is now trying to constrain the energy-hungry industry). And token ownership is often concentrated, too. Steemit, the online forum, is an extreme example: 90% of the “steem power” tokens are held by 2% of users, though the firm is trying to change this.

“Blockchain is a ten-year-old technology. But where are all the applications?” asks Tim O’Reilly, who pushed peer-to-peer and coined the term “Web 2.0” Still, he does not rule out a sudden breakthrough that might cut the “blockchain’s Gordian knot” and make such ledgers more scalable, for instance. Even Facebook seems to see that as a possibility: last month it created a blockchain unit. It is also said to be interested in taking over one of the blockchain projects.

If such a breakthrough were to happen, successful dapps might come in unfamiliar shapes. “It is

easier for new technology paradigms to win in new areas than to re-fight old battles," says Chris Dixon of Andreessen Horowitz, another VC firm with investments in the field. Remember, Google did not win over Microsoft by developing another operating system. What might be the search engine of Web 3.0? Mr Dixon points to services that manage data in creative ways, for instance extracting insights from digital information while letting consumers and companies keep control of their data.

But what if trying to re-decentralise the internet is a fool's errand? That is what China's leaders think.

This article appeared in the Special report section of the print edition under the headline "Raiders of the killer dapp"

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