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Blockchain tokens and the potential democratization of entrepreneurship and innovation

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Abstract Over the past few years, Bitcoin has emerged as the first decentralized, global currency. The rise of Bitcoin has brought attention not only to digital currencies but also to the underlying technology empowering digital currencies: blockchain technology. A blockchain is a distributed ledger that records and secures transactions in a peer-to-peer network. Besides empowering digital currencies, blockchain technology has given innovators the capability of creating digital tokens to represent scarce assets, potentially reshaping the landscape of entrepreneurship and innovation. Blockchain tokens may democratize (1) entrepreneurship by giving entrepreneurs new ways to raise funds and engage stakeholders, and (2) innovation by giving innovators a new way to develop, deploy, and diffuse decentralized applications. Blockchain technology and tokens have sparked a new wave of innovation, which may start to revolutionize entrepreneurship and innovation.

1. The tokenization of money and beyond

Since Bitcoin was first conceptualized in 2008 and implemented in 2009 (Nakamoto, 2008), the price of Bitcoin has gone from almost zero (January 2009) to more than $4,000 (September 2017). In the first commercial transaction using Bitcoin in 2010, 10,000 Bitcoins were used to buy two pizzas (Popper, 2015). In September 2017, the same number of Bitcoins was worth around $40 million and was enough to buy a whole pizza chain. The meteoric rise of Bitcoin has made early adopters rich—very fast. Now, people are assessing whether they should jump on the bandwagon; enthusiasts believe that Bitcoin is unstoppable and will continue to rise in the years to come, while skeptics warn that Bitcoin has no intrinsic value and is just a modern-day pyramid scheme. This debate reflects the uncertainty about the future of Bitcoin.

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Yet, this debate may be misplaced; what is important may not be Bitcoin itself but the underlying technology empowering Bitcoin: blockchain technology (Tapscott & Tapscott, 2016). Even if Bitcoin fails and disappears in the future, the underlying technology will stay with us and will continue to disrupt existing businesses and create new industries.

A blockchain is a distributed ledger that is usually managed by a peer-to-peer network (Buterin, 2014b; Nakamoto, 2008). In the distributed ledger, transactions are organized into blocks that are linked together into a chain. In a blockchain, transactions are validated and recorded by distributed consensus in the peer-to-peer network, eliminating the need for a trusted central entity. Once transactions are validated, they become irreversible, verifiable, permanent, and secure on the blockchain. Because of these characteristics, blockchain technology is well-suited for empowering financial transactions, and its first successful application is the creation of Bitcoin—the first global, decentralized digital currency. Empowered by blockchain technology, Bitcoin and other digital currencies have tokenized and decentralized money, leading to potential disruption in financial industries (Larios-Hernández, 2017). As blockchain technology advances, it becomes capable of tokenizing and decentralizing not only money but also other scarce assets, significantly expanding its disruptive potential (Tapscott & Tapscott, 2016).

The application of blockchain technology to things beyond digital currencies requires new developments in the technology itself (Diedrich, 2016). In 2013, a group of developers led by Vitalik Buterin initiated a project called Ethereum to expand the capabilities of blockchain technology. They recognized the limits of the Bitcoin blockchain. Bitcoin by design was mostly an application—or a platform with very limited capabilities. They wanted Ethereum to become a general-purpose development platform that could be relied upon to create decentralized applications and digital tokens (Buterin, 2014b; Wood, 2014). The Ethereum platform was released in 2015 and the Ethereum community has been growing rapidly, sparking a new wave of innovation. Developers have used the platform to create a wide variety of decentralized applications as well as digital tokens that can be used to interact with decentralized applications. Empowered by Ethereum, developers can now tokenize almost any scarce asset. In the process of tokenizing scarce assets, entrepreneurs and innovators have started to realize the far-reaching, disruptive power of blockchain technology and tokens.

Blockchain tokens can be created on top of a blockchain and can be used to represent a wide range of scarce assets beyond currencies. Some blockchain tokens are like preorders in preordering crowdfunding campaigns, while other blockchain tokens are like ownership stakes in profit-sharing crowdfunding campaigns (Belleflamme, Lambert, & Schwienbacher, 2014). Provided with the ability to create blockchain tokens, developers realize that they can tokenize projects and sell blockchain tokens to fund projects. In no time, a new way of fundraising has emerged: initial coin offerings (ICOs). Like crowdfunding (Belleflamme et al., 2014; Mollick, 2014), ICOs bypass traditional intermediaries (i.e., venture capitalists and investment bankers) and raise funds directly from early investors. Unlike crowdfunding investments, however, blockchain tokens are scarce, global, liquid, and tradable, making them especially appealing to global investors (Coinbase, 2016; Massey, Dalal, & Dakshinamoorthy, 2017).

For entrepreneurs and innovators, blockchain tokens are not only a new way of raising funds but also a new way of building ecosystems. By issuing and selling blockchain tokens, developers can co-opt complementors, early adopters, opinion leaders, and other stakeholders. Blockchain technology and tokens have given entrepreneurs new capabilities and have started to reshape entrepreneurship and innovation. In this article, we will explore how it reshapes fundraising, investing, community building, and open sourcing (see Table 1 for a concise summary).

2. Fundraising through ICOs

ICOs (also known as token sales) are a new way for startups to raise funds—and for blockchain startups, perhaps the prevailing way. This new method of fundraising has existed for only a couple of years, and it has already enabled entrepreneurs and innovators to raise billions of dollars from global investors. Nevertheless, this method is still immature and is somewhat controversial. It may continue to evolve and develop, allowing it to play increasingly important roles in the financing of entrepreneurship and innovation.

2.1. What are blockchain tokens?

Blockchain tokens can represent a wide range of scarce assets, such as currencies, securities, properties, loyalty points, and gift certificates, among others (Buterin, 2014b). Blockchain tokens usually either have a fixed supply or follow a transparent supply schedule, making them anti-inflationary. Moreover, they can be transferred between parties

Table 1. How blockchain tokens shape entrepreneurship and innovation

	Without Tokens	With Tokens
Fundraising	• Entrepreneurs may raise funds from angel investors or venture capitalists. • Entrepreneurs may raise funds from the public through crowdfunding.	• Entrepreneurs can raise funds directly from investors across the globe. • Entrepreneurs can raise funds from the public through initial coin offerings.
Investing	• Average investors have few opportunities to invest in promising early-stage ventures. • Investors have limited liquidity with private company investments.	• Average investors can have almost equal opportunities to invest in early-stage ventures across the globe through blockchain tokens. • Investors enjoy almost immediate liquidity with blockchain tokens.
Community Building	• Platforms may start to appeal to users when they enjoy strong network effects. • Platforms may start to appeal to complementors when they enjoy strong network effects.	• Platforms can reward early adopters with tokens, compensating for the lack of network effects. • Platforms can reward early complementors with tokens, compensating for the lack of network effects.
Open Sourcing	• Open-source projects may fund their continued development through donations. • Open-source projects usually do not share their success with core developers.	• Open-source projects can fund their continued development through token sales. • Open-source projects can share their success with core developers through tokens.

without the involvement of a central entity and can be traded on digital currency exchanges without borders.

There are two major types of blockchain tokens: currency and token. A currency is usually native to a blockchain. Since blockchain technology builds upon cryptography, such a currency is usually called a cryptocurrency. The primary example is Bitcoin, which is the native currency of the Bitcoin blockchain (Nakamoto, 2008). The Bitcoin blockchain allows users to store and transfer Bitcoins on a peer-to-peer network. Another example is Ether, which is the native currency of the Ethereum blockchain. Like the Bitcoin blockchain, the Ethereum blockchain allows users to store and transfer Ethers on a peer-to-peer network. In addition, the Ethereum blockchain can empower smart contracts and decentralized applications, which must use Ether to pay for the computational services provided by the Ethereum platform (Buterin, 2014b).

Unlike a currency, a token is not native to a blockchain but is created on top of a blockchain and governed by a smart contract (Massey et al., 2017). On the Ethereum platform, for instance, most tokens are governed by smart contracts following the common standard called ERC20, which specifies a set of functions and events that all ERC20-compliant smart contracts should implement. By following the same standard, ERC20 tokens can be easily recognized and understood in the Ethereum ecosystem. ERC20 tokens have been created to represent a wide range of digitalized assets, allowing them to play important roles in the Ethereum ecosystem. The value of these tokens depends on the value of the underlying assets and services that these tokens represent. For instance, TenX (2017) is a blockchain-enabled payment service; it has a wallet that allows users to store their cryptocurrencies and a card that allows users to spend them. TenX has issued the Pay token. Users of the TenX card can earn the Pay token, just as credit card users can earn reward points. In addition, holders of the Pay token can earn 0.5% of the entire payment volume on the TenX payment platform. Hence, the value of the Pay token depends fundamentally on the total payment volume on the platform. As the total payment volume increases, the value of the Pay token will increase, since the total supply of Pay tokens has been capped at 205.2 million. Like other blockchain tokens, the Pay token can be transferred easily among users and can be traded for other cryptocurrencies such as Bitcoin and Ether.

2.2. How do ICOs work?

In an ICO (also known as a token sale), a project team sells its token to the public for the first time.

An ICO is simply a Kickstarter-style crowdfunding campaign that allows the public to participate in an early-stage project. However, blockchain tokens are usually tradable, while Kickstarter purchases usually are not. By selling tokens to the public across the globe, a project team can raise financial capital to support the development of its project.

To undertake an ICO, a project team must publish a white paper describing the project and the roles of the token in the project (Coinbase, 2016; Massey et al., 2017). In the white paper, the project team details a development roadmap and estimates the funds needed to move the project toward each major milestone. In pricing the token, the project team has to value the project according to the current project stage. The project team reserves a certain percentage of the tokens to fund the continued development of the project and to reward the development team before selling a large portion of the tokens to the public.

An ICO is a new and powerful way for projects to raise funds; it can raise funds from investors across the globe (Jackson, 2017). It is more than a new way of raising funds; it is a new way of engaging early stakeholders in building an ecosystem (Massey et al., 2017). It allows a project team to distribute tokens not only to investors but also to early adopters and community members. By engaging these stakeholders from the very beginning, a project team can build a strong community to facilitate the development, adoption, and diffusion of its project.

It is important to note that people may participate in an ICO for various reasons. Some participants are early adopters; they like to buy the token early for a discount and use the token later. Some participants may be long-term investors in a project; they buy the token because they truly believe in the project. Some participants may be speculators; they buy the token simply because they would like to sell the token at a higher price in the near future. All these people can play important roles in shaping the evolution of a project.

2.3. How do blockchain tokens democratize entrepreneurship?

The token sales model democratizes entrepreneurship by democratizing the access to capital. Traditionally, entrepreneurs have to raise funds from a very select group of angel investors or venture capitalists. Entrepreneurs usually face many obstacles in finding investors who eventually make equity investments (Feld & Mendelson, 2016). The fundraising process is highly inefficient, as entrepreneurs have to present their business plans to many potential investors in order to find someone willing to invest. The fundraising process is also highly localized; investors usually invest only in companies within their social networks and local communities.

ICOs are revolutionizing fundraising. For the first time, entrepreneurs can raise funds from average investors across the globe. Like crowdfunding (Belleflamme et al., 2014; Mollick, 2014), ICOs are open to almost anybody with internet access. Moreover, these offerings are inherently global and thus can raise funds from global investors. ICOs are reshaping fundraising and democratizing access to financial capital, allowing promising projects to get funded more easily.

2.4. The potential drawbacks of ICOs

ICOs have their own drawbacks. First, token sales can be tax inefficient (Cook & Heath, 2017). The proceeds raised through token sales are treated as revenues or deferred revenues, which are subject to tax. In contrast, funds raised through equity financing are not treated as revenues and thus are not subject to tax. Compared with equity financing, ICOs can be an inefficient way to raise money, especially for firms that are subject to high tax rates.

Second, ICOs can be very costly to entrepreneurs. A project in an early stage usually undergoes only one ICO. At the start, entrepreneurs usually have to sell a large portion of a project's tokens (e.g., 80%) to the public when the valuation of the project is low. In early-stage equity financing, entrepreneurs usually sell a much smaller portion of a new venture to investors (e.g., 20%). An ICO, therefore, can be costly to entrepreneurs if a project proves to be truly revolutionary and successful. Nevertheless, it allows the public to share the rewards, as well as the risks, of an early-stage project.

Third, ICOs face regulatory uncertainty. In 2017, some countries (e.g., China and South Korea) declared ICOs illegal and they were banned (Choudhury, 2017; O'Leary, 2017). In the U.S., ICOs are not illegal, yet the Securities and Exchange Commission (SEC) has not offered clear guidelines regarding token sales. According to the SEC, some tokens can be considered securities, although most may not. For instance, the SEC investigated the defunct DAO token and concluded that it was a security and should have been subject to federal securities laws (SEC, 2017b). The DAO token was conceptualized as an investment vehicle, which was used to raise funds (over $150 million) that would be invested in projects approved by holders of the

DAO token. The DAO was considered revolutionary in venture capital financing, as its funds and investment processes were all controlled not by fund managers but by smart contracts. But its smart contracts had a vulnerability that was exploited by hackers, leading to failure of the project. The DAO's failure caught the blockchain community by surprise and led to an investigation by the SEC, increasing uncertainty regarding token sales. Given regulatory uncertainty, entrepreneurs have to make sure that their tokens do not represent securities when they undergo an ICO (Coinbase, 2016). Or, they may want to register their tokens as securities and follow federal securities laws to issue and manage their tokens (Lin, 2017).

3. Investing in blockchain tokens

Blockchain tokens have become a new asset class and have started to attract more and more investors (Beck, 2017; Grayscale, n.d.). Blockchain tokens may be appealing to investors because they are inherently global, highly liquid, and easily tradable. Although attractive, blockchain tokens are also risky, primarily due to fundamental uncertainty and information asymmetry (Sehra, Smith, & Gomes, 2017). Investors have to weigh the benefits against the risks when investing in blockchain tokens.

3.1. The benefits of investing in blockchain tokens

Many investors become interested in blockchain tokens as they witness the meteoric rise of cryptocurrencies, such as Bitcoin, Ether, and Dash. In 2017, for instance, few asset classes achieved higher returns than blockchain tokens. From January 1, 2017, to September 30, 2017, the total market capitalization of all cryptocurrencies grew from $18 billion to $148 billion (Coinmarketcap, 2017). Over this period, individual cryptocurrencies also grew rapidly: Bitcoin surged from $963.66 to $4,338.71; Ether from $7.98 to $301.46; and Dash from $11.21 to $327.14 (Coinmarketcap, 2017). Overall, blockchain tokens have given investors very attractive returns. Besides, they are ideal assets for investment diversification, as the price movements of blockchain tokens have little correlation with the price movements of traditional asset classes (Chuen, Guo, & Wang, 2018; Elendner, Trimborn, Ong, & Lee, 2016).

Nevertheless, the total market capitalization of blockchain tokens is still relatively small. As of September 30, 2017, the total market capitalization of all blockchain tokens was $148 billion, which was much smaller than the stock market or the bond market. Given its relatively small size, a large trade may significantly impact prices, making the market less attractive to institutional investors. In addition, the current market seems to be dominated by retail investors, making it quite inefficient. The market may take some time to mature gradually. Nevertheless, blockchain tokens are still quite attractive to many investors, as they still offer very attractive returns and good opportunities for investment diversification.

Moreover, blockchain tokens appeal to investors because they offer equal access to investment opportunities, democratizing venture investments across the globe. Traditionally, only professional and accredited investors have opportunities to see and invest in early-stage projects; attractive investment opportunities are usually not equally accessible to all investors. Like crowdfunding, blockchain tokens give all investors an equal opportunity to participate in early-stage investments (Belleflamme et al., 2014; Mollick, 2014). When investing in early-stage projects, investors have the opportunity to enjoy significant upside potential, although they have to bear the downside risks of early-stage investments. By democratizing access to opportunities, blockchain tokens are disrupting traditional venture investments just as social media is disrupting traditional media (Kaplan & Haenlein, 2010; Kietzmann, Hermkens, McCarthy, & Silvestre, 2011).

Furthermore, blockchain tokens are inherently global and are equally accessible to all investors across the globe (Jackson, 2017). Investors from anywhere in the world can buy almost any blockchain tokens that are issued and traded anywhere in the world, democratizing access to opportunities across the globe. In contrast, most traditional venture investments are highly localized, restricting the access to opportunities. With blockchain tokens, investors now can invest in projects across the globe and trade blockchain tokens with investors across the globe.

Blockchain tokens are not only highly accessible but also highly liquid. Blockchain tokens are actively traded on digital currency exchanges such as Bittrex, Bitfinex, and Poloniex. With blockchain tokens, investors can cash out when they need to. In contrast, private company investments are usually illiquid and investors have to suffer severe discounts if they choose to cash out early (Ang, 2014). Blockchain tokens offer almost immediate liquidity, making them especially attractive to investors.

3.2. The risks of investing in blockchain tokens

Investing in blockchain tokens can be risky. Like other early-stage investments (Fama & French, 2004), blockchain tokens have very uncertain returns. They

usually are sold to investors when projects are still in their very early stages with uncertain prospects. If a project proves to be successful, investors earn very attractive returns. If a project fails, however, investors may lose all their investments.

The risks of investing in blockchain tokens arise not only from uncertainty but also from information asymmetry. Information asymmetry makes it difficult for investors to evaluate a project (Akerlof, 1970). ICOs are usually not highly regulated, and some tokens are downright scams. For instance, the SEC charged Maksim Zaslavskiy, the creator of REcoin, with fraud in September 2017. According to the SEC, Zaslavskiy issued REcoin and claimed to use the funds raised to invest in real estate, but no real investment had actually been made (SEC, 2017a). Given the existence of scams and frauds, investors have to be careful not to invest in fraudulent tokens. Investors must perform due diligence before token investment.

4. Building user and developer communities

Blockchain tokens are a mechanism for wealth sharing. They can be used to incentivize early adopters and developers, facilitating adoption and community building.

4.1. Incentivizing early adopters

Most successful companies are multi-sided platforms, and their success depends critically on network effects (Parker, Van Alstyne, & Choudary, 2016). When a platform is first launched, however, it usually has few users and few complementary products, resulting in limited network effects. One of the biggest challenges in creating a new platform is to attract initial users when the platform enjoys limited network effects. Traditionally, a new platform may incentivize early adopters by offering free services or giving big discounts. However, when a multi-sided platform is in its earliest stage, even free services may not be particularly appealing to early adopters.

Blockchain tokens offer platforms a new way to attract early adopters. A platform can distribute its blockchain tokens to early adopters for free or at a low price, giving early adopters the opportunity to benefit financially from the success of the platform. By giving early adopters financial incentives, an early-stage platform can compensate early adopters for its limited usefulness, facilitating the adoption and diffusion of the platform. For instance, early adopters of Bitcoin were able to earn or purchase Bitcoin at very low prices, allowing them to benefit greatly from the success of Bitcoin. Many early adopters have become rich with the meteoric rise of Bitcoin and have become evangelists promoting the subsequent diffusion of Bitcoin (Popper, 2015).

Furthermore, blockchain tokens can be used to incentivize users to use platforms more often, perhaps by rewarding active users with tokens. For instance, the messaging application Kik distributes its token, Kin, to its active users in proportion to their usage volume, thereby encouraging active use of the application (Kik, 2017). Overall, blockchain tokens can play important roles in attracting early adopters and retaining active users.

4.2. Incentivizing developers to develop complementary products

Blockchain tokens can help platforms attract developers. A platform has to attract developers to develop complementary products in order to increase the total value of the platform (Parker et al., 2016). When a platform starts with a small installed base, however, it may not be able to attract early developers, as the market for complementary products is too small. Without complementary products, however, the platform may be of limited use to early adopters.

Blockchain tokens offer a new way for platforms to incentivize early developers: a platform can grant its early developers blockchain tokens, giving them financial stakes in the success of the platform. With blockchain tokens, early developers can benefit not only from the success of their complementary products but also from the success of the platform itself. As a result, early developers may be willing to develop complementary products for a platform even when the initial installed base is small. Overall, blockchain tokens give platform owners a new way to share the success of their platforms with early developers, incentivizing early developers to contribute complementary products to their platforms.

5. Open sourcing

Blockchain tokens give open-source projects a new way of funding their continued development and compensating core developers.

5.1. Funding and supporting open-source projects

Open-source projects have created tremendous value for society, but they tend to capture little value for themselves. For instance, Wikipedia, which has created tremendous social value, has to ask constantly for small donations to fund the continued

development of the project. Like Wikipedia, most open-source projects are not well funded, which can potentially hamper their development. It would be nice if Wikipedia, as well as other open-source projects, could find ways to capture some value.

Blockchain tokens may give open-source projects a new way to fund and support continued development. With blockchain technology, open-source projects can raise funds not by asking for donations but by issuing blockchain tokens. By issuing blockchain tokens, open-source projects can capture some of the value they have created, giving them financial resources to support the continued development of these projects. Ethereum is a good case in point. The Ethereum project was governed by the Ethereum Foundation, which carried out an initial offering of its token—Ether—to fund the development of the project (Buterin, 2014a). Through the ICO, the Ethereum Foundation raised a substantial amount of money to fund the development of the Ethereum project. In addition, the Ethereum Foundation retained a substantial number of Ethers. By raising money through an ICO and holding a substantial number of Ethers, the Ethereum Foundation can capture a portion of the value that the Ethereum project has created, allowing it to retain financial independence and have enough resources to support the continued development of the Ethereum project.

By enabling open-source projects to capture some of the value they have created, blockchain tokens not only support the continued development of existing projects but also encourage the creation of new open-source projects. Over the past few years, blockchain tokens and token sales have facilitated the creation of a large number of major blockchain projects, such as Bancor, EOS, Status, Tezos, and Filecoin. In the years to come, blockchain tokens may allow more and more open-source projects to raise funds and support continued development.

5.2. Compensating open-source community contributors

One of the biggest challenges of open-source projects is the engagement of core developers and contributors (Lerner & Tirole, 2002). Core developers and contributors are critical to the success of open-source projects, but they are not usually well compensated, at least financially. If these core people do not benefit directly from the success of open-source projects, what motivates them to contribute?

It is possible that core developers of open-source projects are motivated by things beyond financial gain—such as reputation, social capital, and expertise—and thus keep making their contributions (Hertel, Niedner, & Herrmann, 2003; Lerner & Tirole, 2002). Without appropriate incentive structures, it is possible that developers may make contributions to open-source projects in ad hoc ways. As a result, some necessary developments may fail to happen. Even if developers are willing to make contributions without financial incentives, it is still quite strange that the people contributing the most do not benefit financially from the success of open-source projects.

Blockchain tokens may offer a new way for open-source projects to compensate their core developers. Again, take Ethereum as an example. The Ethereum Foundation distributed a substantial number of Ethers to its core developers in its ICO as a way to compensate and motivate them. In doing this, the Ethereum Foundation aligned the incentives of its core developers with the goals of the Ethereum project. Since the value of Ether depends fundamentally on the success of the Ethereum project, core developers have strong incentives to make the project a success, motivating them to keep contributing to the project. Blockchain tokens can become a new way for open-source projects to fund continued development and compensate core developers.

6. A new entrepreneurial landscape

Blockchain technology is one of the most revolutionary general-purpose technologies, and it may have far-reaching implications for entrepreneurship and innovation. It has brought to the world not only decentralized, digital currencies but also the capability of creating digital tokens to represent scarce assets. By enabling the creation of blockchain tokens, blockchain technology may reshape the landscape of entrepreneurship. Blockchain tokens:

- Enable entrepreneurs to raise funds directly from investors across the globe, democratizing access to financial capital;
- Give investors opportunities to invest in early-stage projects across the globe, democratizing access to investment opportunities;
- Have the potential to restructure fundraising and investing;
- Facilitate the building of user and developer communities;
- Help innovators build user communities by rewarding early adopters and active users with blockchain tokens; and

- Allow innovators to build developer communities by rewarding developers with these tokens.

Furthermore, blockchain tokens may reshape the landscape of open innovation. They allow open-source projects to capture some of the value they have created for society, so they can retain their financial independence, support their continued development, and compensate their core developers. Overall, blockchain technology and tokens have sparked a new wave of innovation, which may continue to reshape entrepreneurship and innovation.

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