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Decentralized Business Models: Impact of blockchain technology on business model generation

Summary: Even though blockchain technology, since its first presentation in the Bitcoin whitepaper, has received lots of attention from both individuals, or private and public international organizations, its development has not always been enthusiastically welcomed and often created more confusion than expected.

Albeit currently almost everyone agrees that blockchain is (technology-wise) the great successor of the Internet, its tremendous potential is also highly challenging. Growing number of various constructs utilizing blockchain technology in a very

innovative manner have emerged. However, they have also created a complex ecosystem with many initiatives being far away from the original blockchain proposition. As a result, it has become crucial to understand what blockchain technology has to offer, what kind of impact it could have on existing businesses, and whether blockchain allows new business models to be created. The aim of this paper is to discuss and evaluate both the blockchain's potential, as well as its limitations and its implications for development and generation of business models.

Keywords: blockchain, decentralisation, business model, cryptoasset, trust

Zdecentralizowane modele biznesowe: wpływ technologii blockchain na modele biznesowe

Streszczenie: Chociaż technologia łańcuchów blokowych, od czasu jej pierwszej prezentacji w Bitcoin Whitepaper, spotkała się z dużym zainteresowaniem zarówno osób prywatnych jak i publicznych organizacji międzynarodowych, jej rozwój nie zawsze był entuzjastycznie przyjmowany i często powodował więcej zamieszania niż się spodziewano. Chociaż obecnie prawie wszyscy zgadzają się, że łańcuch blokowy jest (technologicznie) wielkim następcą Internetu, jego ogromny potencjał jest również dużym wyzwaniem. Stworzyły

one złożony ekosystem, a wiele inicjatyw jest dalekich od pierwotnej propozycji łańcucha blokowego. W rezultacie kluczowe stało się zrozumienie, co technologia łańcuchów blokowych ma do zaoferowania, jaki wpływ może mieć na istniejące przedsiębiorstwa oraz czy łańcuch blokowy pozwala na tworzenie nowych modeli biznesowych. Celem opracowania jest omówienie i ocena zarówno potencjału łańcucha blokowego, jak i jego ograniczeń oraz implikacji dla rozwoju i tworzenia modeli biznesowych.

Słowa kluczowe: blockchain, decentralizacja, model biznesowy, zestaw kryptograficzny, zaufanie

It is hard not to agree that the year 2008 was unforgettable. On the one hand, the world's financial industry – considered as one of the most stable, certain and noble – proved to be full of problems, embezzlements and inconsistencies, with bankruptcy of Lehman Brothers officially starting the second biggest financial crisis in the human history (Konopczak, Sieradzki, Wiernicki, 2010). On the other hand, Bitcoin, a peer to peer electronic cash system (Nakamoto, 2008), together with its underlying decentralized, distributed ledger, blockchain, saw the light of the day.

Most of the world's attention was however concerned with the former, and tried to overcome crisis consequences and set up recovery measures, and only a small group of predominantly “technology geeks” decided to pursue the Bitcoin and blockchain idea further.

In the years preceding the Bitcoin, the world had become extremely complicated with numerous problems rising much faster than their potential solutions. The complexity of systems and reliance on third parties had increased to such levels, that it had become not only hard to manage but almost impossible to analyze or define preventive measures. Size and quality of derivatives market (Hera, 2010) before the financial crash, or bonds ratings (Friedman, Friedman, 2009) given by prestigious agencies were only a few out of many examples of abused power, manipulation or even corruption. It was almost certain that such practises could not last forever and the correction was about to come. Such a “moment of truth” happened to financial industry in 2008, with one of its most prestigious institutions falling into bankruptcy (Knight, 2009; Koehn, 2009).

Financial crisis was, nevertheless, not the only one trouble that humanity had to

face. There were many more or less prominent disturbances across various sectors, lacking the procedure that could either terminate their further progress or propose the alternative solution-oriented development path (Atzori, 2015; Forde, 2017; Mainelli, 2017; Tapscott, Tapscott, 2016). Newly introduced platform-based companies, such as Facebook or Airbnb, have become on the one hand extremely powerful and thus able to dictate conditions for their users but on the other hand, also highly vulnerable, due to their centralized and data-driven character, and as a result, prone to data manipulation or hacker attacks (Alstyne, Parker, Choudary, 2016; Choudary, 2015; Kenney, Zysman, 2015; Schrage, 2016; Täuscher, Laudien, 2018).

Parallel to these troubles, blockchain technology was slowly gaining momentum. Even though at the beginning blockchain technology, which was firstly introduced by Satoshi Nakamoto in the Bitcoin whitepaper (Nakamoto, 2008), was either wrongly understood or completely ignored by general public, its potential did not go completely unnoticed.

Few players, mainly with technical background and libertarian approach, decided to profoundly analyze blockchain concept and to experiment with its proposition. More and more projects have been trying to incorporate blockchain into their existing businesses (such as Wal-Mart (Business Wire, 2017), Maersk (IBM, 2018) or Nasdaq (Castillo, 2019; Nasdaq, 2018)) together with several new completely blockchain-based initiatives being launched even more regularly (e.g. Ethereum, Waves, Nem). As a result, gradually it has become much clearer that blockchain technology, and not Bitcoin, has a lot to offer.

Nevertheless, lack of regulation, standards and business or technical taxonomies, together with an open-source nature of the protocol and the overwhelming “fear of missing out” or “blockchain

hype” (Benedetti, Kostovetsky, 2018; Gantori, et al., 2017; Johnson, 2018), have led to a completely new market situation, which, unfortunately, often proved to be contradictory to blockchain development. ICO, known as Initial Coin Offering (FabricVentures, TokenData, 2018; Hacker, Thomale, 2017a; Howell, Niessner, Yermack, 2018; Lee, Li, Shin, 2018; Williams-Grut, 2018; Yadav, 2017) enabled by the new technology, allowed almost everybody to collect funds in a completely independent manner. Initially introduced as a democratization of the funding process, it has, however, proven to be abused by many illicit players, with the majority of projects ending up as scams (Alexandre, 2018; CipherTrace, 2018). As a result, due to the increasing size of illegal practices and landscape complexity, various regulators have started wondering about proper blockchain regulation and its standardization (FINMA, 2018; Gibraltar FSC, 2018; The Law Library of Congress, 2018).

Additionally, blockchain construct, being similar to Lego blocks (Maxwell, Speed, Campbell, 2015) allowed for creation of various, often not truly decentralized, implementations offering value proposition that was also quite frequently far away from the original one. Such a concept-diversity or flexibility, fueled by increasing interests, motivated various national and international organizations to launch their own blockchain observatories – e.g. EU Blockchain Observatory & Forum, departments or initiatives – Long Island Iced Tea Corporation (Shapira, Leinz, 2017), often for the marketing rather than business reasons. Predictions, such as the one published already in 2015 by World Economic Forum according to which till 2027 about 10% of world’s GDP would be stored on blockchain and almost every industry would find its blockchain-use case, only increased already huge hype.

Even though the analysis process has been active for already few years, with many national and international organizations, public bodies, regulators, researchers and individual players publishing blockchain studies or reports, no harmonized definitions for both blockchain constructs as well as applications or projects utilizing new technology have been delivered so far.

As a consequence of a mounting complexity, an increasing number of both abusive behaviors as well as innovative projects offering new blockchain-based value propositions, together with worldwide blockchain hype, the study of blockchain, and its reasoning and offering is, therefore, well justified.

This paper focuses on one specific side of the blockchain phenomenon: its business potential, functions and reasoning behind its utilization and implementation. The purpose of the paper is to identify and discuss the criteria and factors that are crucial for building a successful blockchain business model. The author also proposes an overview of various roles which blockchain can fulfill together with their value proposition, defines and evaluates key blockchain indicators, and recommends potential strategies which various organizations, depending on their business models, could follow. In order to answer the research questions, the author conducted desk research and analyzed various documents published by founders, regulators and consulting companies. Due to the novelty of the topic and limited number of Polish publications, the literature positions are mostly international and allow to provide the most up to date state of the research in the field of blockchain technology and related issues.

Blockchain: characteristics and classifications

In order to be able to evaluate the business potential of the new technology,

it is essential to become familiar with the key concepts that build its foundation. Even though blockchain technology is a very complex construct that has an open-source nature, it is not impossible and even highly important to understand the logic and structure of this new invention.

Blockchain concept and its technical characteristics

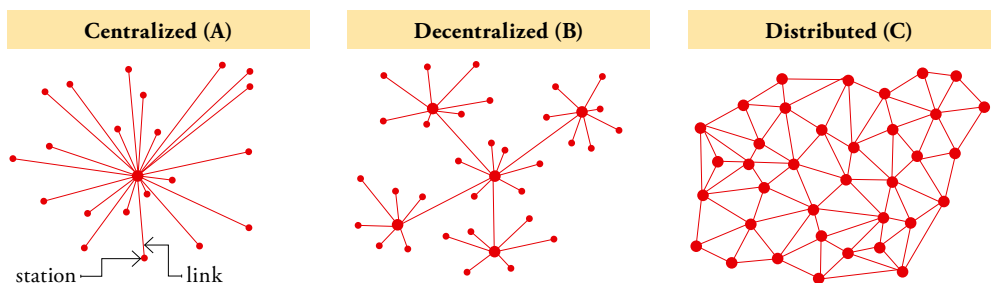
Blockchain is often described as a decentralized, distributed, append-only ledger that is immutable, synchronized, transparent and secure (Bonneau, Felten, Miller, Narayanan, 2016; Clark, Narayanan, 2017; Davidson, De Filippi, Potts, 2018; Pilkington, 2016; Szpringer, 2018). In its original version, it was proposed as a solution to so called “double spending problem” (Budish, 2018; Catalini, Gans, 2018; Dwyer, 2015; Efanov, Roschin, 2018; Wayner, 1997) enabling the value exchange between untrusted parties without the need for a middleman (Gupta, 2017; Moore, Christin, 2013). Blockchain is also the first concept which allows for building the logically centralized while organizationally decentralized structures, making them distinct from any currently existing constructs. Figure 1 presents the difference between centralized, distributed and decentralized structures.

As a result of this long list of potential features, various definitions of blockchain have been created. From being called a purely new technology or general purpose technology (Bresnahan, 1992; Catalini, Gans, 2018; Kane, 2017), in recent

years blockchain has been named either a new economy or a new organizational structure (Davidson, et al., 2018; Iansiti, Lakhani, 2017; The Economist, 2018). Thanks to its broad value proposition together with a very clever solution to well-known problem (double spending), blockchain allows for building new constructs which could be managed, governed and organized in a fully decentralized manner, making them similar to independent economies organized around the platform value proposition and not limited by geographical location.

Similar to the Internet, which solved the information exchange challenge, blockchain made it possible to exchange value (Tapscott, Tapscott, 2017) which has already been proven by its first use case, Bitcoin, which is considered a private (as not issued by a sovereign) decentralized digital currency (Athey, Catalini, Tucker, 2017; Bank für Internationalen Zahlungsausgleich, Committee on Payments and Market Infrastructures, 2015; Dwyer, 2015; Zajac, 2018). Also, like Internet which transformed various business models, blockchain offers an advantage with regard to many other areas and processes. Such a versatile list of potential use cases is possible due to its innovative technical characteristics, which could be utilized either separately or together and thus improve existing businesses or lead to the creation of completely new business models that fulfill different and often novel functions (Seebacher, Maleshkova, 2018). As a consequence, blockchain is

Figure 1 **Blockchain Structures**



Source: own work based on information provided by the Bank of International Settlements (2017).

Figure 2 **Blockchain structures**

RIGHTS	PUBLIC		PRIVATE	
Permissioned	Read, Write	Open (public)	Read, Write	Closed (private)
	Change, Verify	Permissioned	Change, Verify	Permissioned
	Examples	Wepower, Amply*	Examples	Hyperledger, Corda
Permissionless	Read, Write	Open (public)	Read, Write	Closed (private)
	Change, Verify	Permissionless	Change, Verify	Permissionless
	Examples	Bitcoin, Erethreum	Examples	None

Source: own work based on various sources (Hileman, Rauchs, 2017; World Bank Group, 2017; Xu, et al., 2017).

more properly understood as a category rather than a single concept, with many versions of blockchain-based innovations either created so far or to be defined in the future.

Blockchain classifications

Albeit blockchain-ecosystem is extremely complex, it is possible to classify projects according to two criteria (Hileman, Rauchs, 2017; Wüst, Gervais, 2017). The first classification criterion, defined by the “read and write” rights, differentiates between private and public blockchain. The former is known as a setup in which only pre-defined and accepted participants could both see the content of the blockchain in the real time, as well as propose the new data entries. The latter, however, offers a completely opposite features as it gives both reading and writing rights to everybody.

The second classification criterion, characterized by “change and verify” rights also consist of two subclasses, permissioned and permissionless. Permissioned group involves projects in which only pre-defined and accepted members could verify the correctness of the new data entries and decide whether new data should be added to the blockchain or not, which results in changing, or more precisely extending existing chain. In a permissionless version, everybody could become the verifier and everybody is allowed to participate in the changing process, with the process rules being defined in the open source protocol.

In order to describe a complete blockchain setup, these four subclasses, or more precisely, rights, should be pooled together so that four general types of blockchain could be defined (Figure 2): public-permissionless (e.g. Bitcoin, Ethereum), public-permissioned (e.g. WePower, Amply), private-permissionless (e.g. Hyperledger, Corda), private-permissioned.

These should, however, not be considered as a finite classification, but be understood more as a fluid concept, indicating both continuously evolving nature of the blockchain as well as its growing complexity and flexibility. Moreover, it has to be highlighted that not the characteristics as such are essential but the value proposition which they offer, because the value indicates the art of the business case which, thanks to them, could be built or improved. As a result, different classes apply to different industries or solve different problems (Ito, Narula, Ali, 2017). Therefore, it is important to know what is the purpose or motivation behind blockchain implementation in order to decide on the proper version and thus make the most of it.

Blockchain functions

Blockchain, since its official announcement, has proved to be able to fulfill various needs and serve diverse functions in a complementary or independent manner.

First of all, the blockchain definition states that it is a “decentralized, distributed ledger”, indicating that blockchain

could function as a storage of information, that does not require a central managing authority and is updated according to publicly available rules (Hacker, Thomale, 2017b). As a result, in every business setup where it is essential to have an information ledger, that covers entries coming from various parties, often with conflicting interests, and thus till now required a third party providing this essential “trust layer” confirming the current state of the ledger, blockchain could prove to be a solution worth deeper analysis. Blockchain’s record keeping function is, therefore, especially useful with regard to all processes where there is a need for ownership tracking or status update which, for example, are a core part of a supply chain or financial industry business models (Casey, Wong, 2017; Catalini, 2017; Petersen, Hackius, See, 2017; Scott, 2016; Tapscott, Tapscott, 2017). The immutable nature of such ledger additionally makes this concept even more attractive, however, it is not free from any potential risks which could emerge for example in case there would be a few big players either deciding on blockchain entries or in charge of blockchain update. Nevertheless, such an “information storage” or “record keeping” function, which eliminates the middleman, allows for considerable cost savings and efficiency improvements. At least in theory as no precise data has been provided so far.

At this point, it is worth mentioning that “record keeping” is not the same as “record validation or confirmation”. Blockchain on its own can fulfill both roles only in case of simple digital data and thus eliminating third parties only when the role of the middlemen is about naive confirmation. In that case, smart contracts (Bartoletti, Pompianu, 2017; Savelyev, 2018), programs which run on the top of the blockchain according to predefined rules, could be very promising as they allow for even greater automation

of these repetitive tasks. In situations, however, when entry does not have a digital form and/or does require a complex verification procedure, there is a need for an additional layer, namely “record validation”. In such cases, specialized knowledge or a dedicated authority are required in order to check correctness or avoid the mismanagement of goods or services, especially in situation when such goods are essential for human existence. It partially explains why different blockchain versions are needed and why full decentralization might not at all or not yet be possible.

Secondly, blockchain acts as an enabler or facilitator of communication and business, allowing for peer-to-peer transactions (Wales, 2015). What it offers is thus the creation of new markets, where users could directly exchange their products/services without the need for a centralized and often expensive service. Blockchain creates the market situation with regard to assets which, until now, required third party management as there was no other way to capture their value and/or exchange them peer-to-peer. The music industry could be named as one of many examples which used blockchain technology to allow the initial producers, not the intermediaries, to capture the value which they have created (Heap, 2017).

The peer-to-peer transaction function of blockchain offers also a possibility to democratize funding of new ventures or ideas which until now had to rely on either third party services like crowdfunding platforms (such as Kickstarter) (Amsden, Schweizer, 2018; Hagedorn, Pinkwart, 2013; Jeongmin Lee, Parlour, 2018); or their realization was depended on venture or equity funding. Blockchain has a potential to transform the way new ideas are funded so that more entrepreneurs could realize their plans, and even startups that do not wish to build their use case on blockchain can still benefit

from this new technology and utilize it transaction/funding function, taking advantage of the popular ICO (Initial Coin Offering) process.

This peer-to-peer transaction function could have another positive implication, namely it might bring or improve liquidity with regard to currently illiquid assets. In case of the new ventures, the tokens which are issued in exchange for fiat money could almost directly after the purchase become tradable on various exchanges, which create a secondary market that considerably boosts their liquidity and popularity. Nevertheless, due to highly unregulated nature of the new procedure, it is prone to various vulnerabilities and market abuses (Dabrowski, Janikowski, 2018; Foley, Karlsen, Putniņš, 2018; Houben, Snyers, 2018; Keatinge, Carlisle, Keen, 2018; Keidar, Blemus, 2018), which, however, regulators all over the world try to combat (Hacker, Thomale, 2017b).

Another advantage related to the transaction function of blockchain is the possibility to create ecosystems in which not only people could exchange in peer-to-peer manner, but the whole platform can be organized in such a way that it becomes possible to equally remunerate every member who contributes to platform success. The beauty of this concept lies also in the fact that such an ecosystem eliminates this third party friction which often exists in currently utilized schemes and allows for, mentioned above, fair remuneration of all parties involved, including the network creators.

The third function which blockchain serves is the possibility to create, store, hold and protect digital assets, making it possible for creators to independently from any third party decide on their own possession. The music industry was already mentioned as a good example, where currently creators had to go through middle-

man but not for the purpose of information storage or transaction, but for the sake of its simple monetization and protection. It has been a highly unattractive concept for such artists as most of royalties have gone to third parties, leaving only a very tiny part left for the real creators. Blockchain, however, allows for building a music marketplace where both producers and customers could exchange with one another, and where the whole process would be authorized by blockchain, letting the music creator would be the one in charge of the process (Heap, 2017; S. Lee, 2018). Examples of project which try to utilize blockchain and thus change the way music industry is run include Ujo, Mycelia and Choon.

Blockchain Reasoning

Blockchain, as it was already indicated, is a very complex construct which caused it to become both very attractive and popular as well as pretty dangerous and powerful technology. Even though billions of dollars have been invested either in public or private blockchain-related projects and various prestigious organizations have predicted huge impact that blockchain would have on world's economy, there are still very few working implementations. Many entrepreneurs have tried to take advantage of this new phenomenon and either failed, put it on hold or still struggle to achieve their goals. Regardless of the low success rate, a growing number of executives consider implementation of blockchain in a very near future, which is in line with the continuously rising number of open-source projects (Price-waterhouseCoopers, 2018). Moreover, according to the study conducted by another consulting company, Deloitte, 74% of all blockchain-savvy respondents see the attractive blockchain-based business case and decided to move from analyzing and learning phase to the one focused on building the prospective use cases (2018).

Being aware of various functions which blockchain serves and the value proposition it offers, as well as its growing popularity, the next step is to analyze the reasoning behind the blockchain implementation in order to define the proper setup, avoid expensive mistakes and correctly compare existing implementations.

To Blockchain or not to blockchain

The first question which needs to be answered, is whether blockchain makes sense at all, either for the idea that is planned to be realized or the business model that the public or private corporation is utilizing or is wishing to generate.

Various consulting companies, researchers and self-taught blockchain experts have proposed questions which could help in deciding whether blockchain implementation is either well justified or would rather only add an additional friction layer (Wüst, Gervais, 2017).

A blockchain implementation seems to be well suited when the respective business case requires a database, which stores the information and thus allows for efficient record keeping (first function). Secondly, blockchain should offer an advantage if currently such an information storage is managed by a centralized third party that only adds an additional friction layer and/or is responsible for simple confirmation which does not require specialized knowledge or function and/or has become both too powerful in price/market conditions setting and/or too attack-vulnerable due to the huge amount of data which they hold.

It is important to know that this question tries to evaluate whether there is a need for third party and whether it is possible to decentralize the function it serves. What it indicates is that the role of the middleman cannot always be taken over by blockchain. As it was already indicated in the part about functions, record keeping is not the same as record validation

and exactly these aspects should be clarified in answering the second question.

Thirdly, blockchain might prove to be a sound choice in case there are various users which should be interacting with the database. What kind of interaction is the question about blockchain version so at this general stage, it is important to decide whether such an interaction exist or does not take place.

Moreover, in case the users do not trust each other because, for example, they do have conflicting interests, the implementation of blockchain might also offer an advantage as otherwise such users would have to rely on third party service or in case such a conflict does not exist (because for example all users have the same goal), they would be well served by utilizing various copies of the same database. Finally, if transactions are interdependent, meaning that their order matters, blockchain with its chain-logic and timestamp, could also prove to be a reasonable idea.

Asset and business related blockchain indicators

Even though all general blockchain prerequisites are met, it is worth consulting additional blockchain indicators prior to the final decision on blockchain implementation.

Firstly, it should be considered whether the goal of the planned blockchain implementation is to eliminate or minimize the friction which currently exists in the process and would not add additional one, making the whole process even more complex than it was originally. Once the process is currently well-served by offered infrastructure and there is no justified need to make it decentralized (even though it is possible), it could be wise not to do so, as such a step could offer only this additional layer of friction. Moreover, many existing processes, even though centralized, have been structured in such a way in order to facilitate everyday life

because for example there is not enough time or expertise allowing for individual decision making.

What blockchain offers is the possibility to democratize processes which should be democratized and eventually eliminate the information asymmetry with regard to processes that currently are done “behind the curtain”. But the goal of blockchain is definitely not to democratize every single process. What is even more important is this information asymmetry, which instead of being minimized could, in case the technology’s value proposition is wrongly interpreted, become counterproductive and lead to many problems (Tabarrok, Cowen, 2015).

Secondly, blockchain eliminates the need for trust, by making it possible for everybody to individually check the current status and decide on the appropriate strategy. Nevertheless, it is worth analyzing when such a trust is needed and when it is an unjustified practice utilized by the middleman. In case of the latter situation, blockchain allows for elimination of “trust premium” and enables two opposite parties to safely transact with one another, even in case of opposite interests (Antonopoulos, 2014; Kenney, Zysman, 2015; Mattila, Seppälä, 2016).

Thirdly, it should be considered what kind of assets are about to be stored on the blockchain. With regard to this indicator there are two subclasses which have to be considered: private/public assets (incl. goods and services) and digital/digitized assets (incl. goods and services). In general, it should be possible that provision of private assets, which are not illegal or forbidden, is open to everybody. Throughout the history, however, the various practices have been utilized, leading to the situation in which there are often a few big players responsible for manufacturing of goods and many small producers who struggle with their businesses. The reason behind this was the way how business was orga-

nized as some practices were for example beneficial only after reaching a huge scale (allowing to benefit from well-known concept of economies of scale). Blockchain makes it possible for everybody to join, produce and benefit, and could considerably change this process. It is however mostly true only with regard to digital assets, in case of which there is already a digital form and the delivery process happens completely online. When the process considers real assets, which firstly have to be digitalized prior to putting them (or more precisely their digital representations) on blockchain, what blockchain offer is only the ownership or status tracking of their digital representation and the delivery has to be still executed with the usage of the real world infrastructure.

When it comes to public goods, they require also much more attention. Blockchain could democratize the exchange process and incentivize prosumer behavior, nevertheless, in case of goods that should always be provided and which management requires a kind of oversight, blockchain setup has to be well-designed and in such cases private implementations could prove to be less justified. The art of the asset is also connected to the empowerment issue, namely it raises the questions, whether everybody should really be in charge of provision of goods or whether there is a need for a coordinated process.

There are also other aspects related to assets which are about to be stored on the blockchain that have to be considered prior to making any final decision. With regard to assets that are scarce, comparable and digitally verifiable, it might be well justified to utilize blockchain for the purpose of their exchange and trading. In such cases, blockchain could act as an information storage, or a record verifier. It would also allow for creation of new business models, which bring the market situation to areas where there was none before, with peer-to-peer file storage offered

by Filecoin as a one example. If assets, however, are not scarce, not comparable or their verification could not take place online without the need for any additional tool, original blockchain setup together with its decentralized feature might be considerably limited. Blockchain could, however, still offer added value but the chance of potential risks such as manipulation is much higher and the fact that in case of any wrongdoings the record could not at all or not easily be amended (Feig, 2018), makes this technology not of much use at all. It results from the fact that in such situations, there is a need for additional verification layer (which could be done either by specialized devices or experts) and blockchain fulfills only a record keeping function (not a record validation) and tracks the information about asset ownership (as for example in case of Everledger which tracks Diamonds) or about its current status and origin (e.g. with regard to food traceability). The prerequisite for this record keeping is a proper verification, which results in a creation of digital representation that is only then put on the blockchain. These steps cause the whole process to be vulnerable and prone to potential risks.

Furthermore, as it was already mentioned, the role of third party in the process has to be properly analyzed in order to understand the function which such an authority serves. In situations where there is a need for oversight, resulting from asset type or significance of the process, blockchain could not simply “overtake” or replace the middleman role (Gupta, 2017; Moore, Christin, 2013; Murck, 2017; Wright, De Filippi, 2017). Blockchain could in such cases still offer an added value which should be understood as the transparent information ledger, allowing for real-time analysis of third-party moves. It is especially useful for governance processes, and in such cases blockchain implementation has a poten-

tial to minimize corruption, moral hazard as well as enable a much more efficient judgment or voting processes. Blockchain role in these situation is however not to terminate the role of the governance but to organize it in a highly efficient manner.

Partially connected to the previously described authority issue is the discussion about confirmation, validation and verification. Blockchain is well suited in cases the process is about simple confirmation, which does not require specialized knowledge (e.g. in case of money transmitters). Nevertheless, in situations where there is a need for unique, specialized knowledge or expertise, such a task could not be fulfilled by blockchain. Some processes might become automated thanks to smart contracts, nevertheless, every new, conceptual or creative task would still require an expert consultation.

Blockchain models

When blockchain prerequisites are met and common sense check has delivered a positive result, it is worth considering which type of blockchain is well-suited for the given use case.

The original version utilized by Bitcoin is the public-permissionless blockchain. In such a construct everybody has equal access and equal rights, and both value exchange and information storage are conducted in a very transparent manner. Such structure is truly decentralized, with many proposals offering various technical features and serving different purposes. Public-permissionless construct could be utilized by projects that are interested in tracking and exchanging digital assets, which availability is easy to be verified and where the record validation does not require any specialized knowledge or authority. Everybody is able to participate in validation process which is ruled by predefined mechanism, that requires either staking or spending energy. Assets that are exchanged are scarce and could

be provided by everybody thus there is no monopoly and private nature indicates that no special coordination with regard to them is required. Such a version allows for building completely new business models, creating new products but also improving the existing ones.

The second construct, private-permissioned blockchain, is the complete opposite of the previous one. This version does not take advantage of the one of the main blockchain's propositions, namely decentralization and thus this solution is better described as "centralized decentralization". It is especially useful for companies which have numerous branches all over the world or industries where the one process requires various parties to cooperate. What they are mostly interested in, is utilization of the first blockchain function; precisely they would like to benefit from blockchain being an excellent information storage, able to track the progress of the process. When it comes to assets being stored on the blockchain, in case of this construct, they could be either digital or not, as in a situation when there is a closed group, it possible to organize a tokenization process which would allow for creation of digital representation of the real world asset. As a result, the role of the blockchain as a tracking system and information ledger is even more clear and in such cases the whole exchange process could not happen on chain, which implies that there is a need for synchronization of blockchain value layer with real world infrastructure layer. Interestingly, such a setup has been especially popular among financial industry players, as most of their assets are already in digital form and what is even more important, the whole system is interested in the ownership traction rather than in physical delivery, with most of transactions being cash-settled, making them similar to ownership and account status update. One could imagine

this process as a game where it is essential to know who owns how much, rather than physically having it. As a result, such a blockchain version could bring considerable cost savings or improve the process efficiencies. Nevertheless, it is hard to imagine its utilization for the sake of building new business models. One of the most recognizable examples is the Corda blockchain (Brown, 2018), developed by the R3 group which consist of various international players with their background mostly in the financial industry.

The third option, a public-permissioned structure, even though it is not able to benefit from full decentralization proposition, its implementation in various cases has been well justified, making this construct a preferred solution. What it offers is the publicly available information ledger which is updated by pre-defined players, who decide on the correctness of data entry and data management. Such a construct is desirable when there is a need for a coordination, either by a government or by another group of experts, so that the provision of assets would be certain. As a result, public-permissioned blockchain is especially appealing for public goods, which have to be delivered and their production has to be stimulated. Even though on the first sight one could conclude that the proposition of blockchain, namely independence from third parties such as governments, could not be offered, this version is still well justified. It results from the fact that with regard to few assets or processes, it is not possible not to have any governance at all and what blockchain offers is the transparent information ledger, which, as a result, enables the real-time analysis of every actions and thus minimizes the moral hazard of people being in charge. In order to make this construct work, it than highly important to properly set up the ruling committee so that there would be no "monopoly 2.0" phase with

few players becoming even more powerful. To sum up, such blockchain version allows for more efficient management of public goods and services and could be well utilized by public sector, NGOs and other players that value transparency and smooth coordination.

The fourth blockchain classification, private-permissionless, does not really exist in practice as the value proposition it offers is not appealing and thus proves to be useless. It is hard to imagine that there would be a construct to which even though only few actors would have an access and thus could analyze the current state of affair, everybody would be in charge of data validation without an information about the data status.

Each of presented versions has its own reasoning and there are different motives behind its implementation. Nevertheless, when it comes to true decentralization, only public-permissionless variant can fulfil this promise.

Public-permissionless constructs are mostly utilized by the open-source ventures which are either trying to improve existing products and processes that thanks to blockchain could become much more efficient, or build completely new business models, taking advantage of blockchain value proposition. Such projects introduce the new concept, such as token or cryptocurrency, which serves various functions. It acts as an internal currency, facilitating exchange process as only the token holder could benefit from the asset or service the project offers. Token provides also a remuneration for the project owners/creators, who kept some of these tokens when introducing the platform, hoping that its value increases when the project proves to be successful. Token acts as an incentive for supply, as the asset/service providers receive a token for their service and once its value increases (as a result of e.g. great results), their payment

also goes up. Token is also a part of the security and governance process in a way that it could be earned for security provision and/or use in a voting scheme. One could conclude, that in order to make the project successful, there is a need for both users as well as producers, with one or the other motivating the opposite side. Such a situation is well known platform dilemma, known as “chicken-and-egg problem” (Evans, 2011; Evans, Schmalensee, 2016; Hagi, 2015), indicating that both parties are needed, with each one motivating the other to join, thus making it harder to decide who should or could be the first one to enter.

Blockchain as a result allows for building new, “better than free” business models (The Technium, 2008), which allow for a fair reward of all sides making it considerably different from the concepts utilizing the Internet (Monegro, 2017). In case of the Internet it was really hard to capture the value thus various applications were built on top of the protocol, making it possible to define successful business models able to capture the value. Such setup however did not allow for a fair remuneration of all parties, including developers of open-source TCP/IP protocol creators. Most of the value was taken by the application providers such as Google or Facebook. Their business model was often called “free” (Osterwalder, Pigneur, 2010), because there was no direct service fee for the users, nevertheless, the platforms were turning the users’ data into excellent revenue source, and thus have become highly profitable and also extremely powerful. Blockchain on the other hand, offers a setup in which every party could be fairly rewarded. It results from the token concept that allows for developers’ recognition, acts as an incentive for asset/service providers as well as facilitates the exchange process. As a consequence, a “better than free” model is possible, in which every interaction has its

fairly set price, however whether this new concept could be utilized or not depends on the blockchain version, with some creating even more risk than existed before.

Blockchain – potential strategies

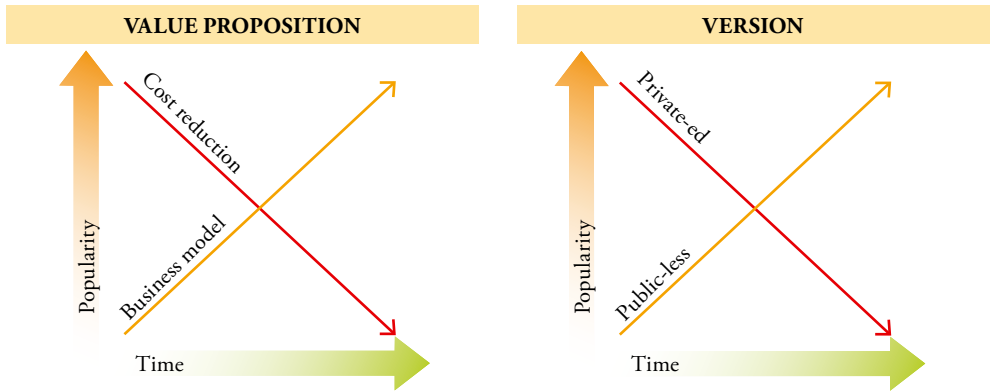
Blockchain implementation should be proceeded with the sound analysis of all blockchain indicators, which evaluate its both general reasoning as well as specific factors. Companies or new projects wishing to implement this new structure, have to be aware of which kind of function blockchain should serve. Additionally, it has to be determined what kind of goods and services are to be stored and exchanged on the blockchain in order to determine the right setup.

Existing companies, trying to take the most advantage of the blockchain implementation should profoundly analyze not only their own use case, but also existing or potential competitors' moves, as well as market changes and development. It is important that they honestly define their true pain points and evaluate if blockchain can provide a solution. Additionally, they have to determine if the process or products which they try to improve with the usage of the blockchain would not soon become either obsolete or would be overtaken by new players. As a result, they should concentrate on these aspects where they act not as a simple middleman but as a clever intermediary and define processes in which they create an add value. Helpful in such an analysis might be the knowledge check to determine which areas require expertise or experience and decide how blockchain technology could improve them. It is worth mentioning that new technologies such as blockchain change the whole ecosystem considerably making it harder to benefit from "the cash cow" strategy (Hedley, 1977; Norburn, Miller, 1981) and more loudly advocating that the "average phase" is over. Therefore, businesses should decide which aspects of

their business model are offering the real added value or define new business models that would allow to take the biggest advantage of the changes. If they want to keep their position, they should analyze which aspects of their business should or could be decentralized and thus concentrate on those which require an oversight, supervision or expertise. Incumbents should also very diligently analyze the new decentralized players in order not to overlook important changes.

It was already proven that companies that concentrate too much on offering better products to their customers, do not realize that there might be an even more attractive alternative created elsewhere. Such companies deliver better products which people, however, need less and in a long term they often lose against new players. These, as professor Christensen called them, disrupters, are slowly getting more customers and continuously improve their products in order to later target the mainstream customers and win against incumbents (Bower, Christensen, 1995; Christensen, Raynor, McDonald, 2015; Oyon, 2010; Satell, n.d.). Such key findings could be very useful for players experimenting with blockchain. Knowing what happened in the past, they could more efficiently choose the areas which are worth blockchain implementation and ignore the ones that sooner or later would be much better served by public-permissionless solutions.

New ventures have various strategies to follow. They could either build the services/products which could be later managed by public governance in public-permissioned setups. They could also build a completely new business model and run them on public-permissionless blockchains or even in private-permissioned setups. Such startups need to profoundly analyze their idea and use case in order to determine the proper structure and do

Figure 3 **Blockchain Future Trends**

Source: own work.

not engage in activities which either could not be served by independent producers or create additional friction. If they define their business model properly, they could become the new disrupter that either introduces new concept with regard to existing products or processes, or completely changes the way the business is run.

Blockchain has an excellent value proposition also for public-sector, NGOs and other social or governmental institutions. The best blockchain setup that applies to these players is the public-permissioned one, where everybody is given a chance to analyze the moves of social actors, while the decision process on important aspects relating to the whole society is governed by few, publicly chosen players.

Blockchain – long term view

As a result, behind each and every blockchain variant there are different motives justifying its implementation. Those who wish to build new business models experiment with public-permissionless constructs, others who do not aim for complete decentralization or could not make their data public but still want to take advantage of time and cost efficiencies prefer private-permissioned implementations and there are also players that utilize public-permissioned versions in order to more efficiently organize their

processes, benefit from greater visibility and incentivize more players to participate. Even though, all of these constructs seem to be currently well justified, and it is well worth considering how the reasoning could change in the long term.

Public-permissionless structures, in despite of often struggling to build a successful business model, would most probably continue to attract many players. Its continuous development would be however governed by more standards, allowing for more efficient elimination of illicit ventures. Based on lessons learned through the first phase, more projects would be able to deliver their value and there would be less mistakes resulting from their mismatched goals or expectations.

The number of private-permissioned constructs would also continue to increase, but in a declining pace. As more decentralized solution would emerge with continuously better use cases, it would be less beneficial to keep various processes in still partially centralized setup. It might result from the fact that more users would chose the decentralized version once it offers the same or even better advantages.

In the long-term, it could be expected that public-permissioned constructs would be more efficiently delivered, as it should become much more obvious where these versions make sense and thus more

successful use cases would be delivered. As these constructs are designed for coordination of public goods or other products which are characterized by market inefficiencies, their development would be rather sustainable. However, there would probably be less players who aim for being in charge of public goods, and well-functioning governance mechanisms would be created. Figure 3 presents some potential trends that might emerge in the near future.

Conclusions

Blockchain technology has a huge potential to transform the way how value is exchanged. However, even though blockchain could provide a solution to many existing problems, or allow for building completely new business models, it is very well possible it doesn't offer any value addition at all. One of the key findings of the conducted desk research is therefore that it is highly important to understand not only the technical features and their scope across various blockchain versions, but also to define business characteristics or criteria which make it possible to decide whether a blockchain implementation is well justified, and in case of positive answer, help to identify the best blockchain version.

Currently, there are four sub-categories according to which blockchain structures

could be classified: public-permissionless, public-permissioned, private-permissionless and private-permissioned. The first one is mostly utilized by cryptocurrencies such as Bitcoin; the second is popular among projects built around social goods; the third has not been implemented; the fourth is the one preferred by the private groups or consortia.

The conducted research however proved that it is not possible to define which structure is better and which one is worse as each and every one of them serves a different purpose and solves other problems. As a result, it is essential to profoundly analyze the initial business case in order to determine if a blockchain implementation is well justified and if so, to follow the checklist with key blockchain indicators, including also assets' and processes' characteristics in order to define the most optimal blockchain structure. It is also important to continuously analyze the market and both observe what all competitors are doing and not ignoring new entrants as these could deliver the most successful business case. Even though various blockchain structures serve different needs, the truly decentralized business model could be built with the usage of public-permissionless blockchain and it is predicted that the number of these constructs would continue to grow in the future.

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