Blockchain and XBRL
– the centauromachy? A literature review

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"One approach is to combine best-of-both-worlds by a bespoke arm system mounted on a quadruped robot to create a centaur-like robot. A centaur is a mythological creature with the upper body of a human and a lower body of a horse. Similar to the centaur, half-human and half-horse composition in robotics can be exploited to achieve stability and manipulation capabilities"(F et al., 2017, p.248)

Abstract:

Blockchain is seen as revolutionary or incremental change technology. Very often in the existing literature the double-entry bookkeeping is mentioned as a business case for blockchain, which enables major efficiency gains by distributed technology and elimination of traditional intermediaries such as auditors or banks. In the last twenty years a technological revolution also occurred fueled by the widespread diffusion of the internet. With regard to Financial Reporting, this trend also generated the development of Extensible Business Reporting Language (XBRL), which many accounting experts expect to revolutionize financial reporting since it allows corporate financial information to be aggregated, transmitted and analyzed quicker and more accurately. Blockchain and XBRL combined may represent a "centauromachy". Our study summarises the existing literature.

Key words: Blockchain, digital reporting, XBRL, distributed ledgers, taxonomy
JEL classification: M42.

1   Introduction

According to the academic and non-academic literature many authors mention for blockchain accounting as a business case: blockchain represents an alternative to ownership ledgers based on classical double-entry (Yermack, 2017, Deloitte, 2018, Dai and Vasarhelyi, 2017, Byström, 2016, Andersen, 2016); blockchain could make accounting information more trustworthy and more timely available, as firms could keep their financial records in blockchains (Byström, 2016);blockchain can transform current auditing practices (Dai and Vasarhelyi, 2017). It is remarkable that even in a classical economic handbook from Keynes a form of blockchain can be traced back. The "Master-Economist", who "must possess a rare combination of gifts. He must be mathematician, historian, statesman, philosopher—in some degree" (Keynes, 1924) that different skills need to be combined, while for blockchain and XBRL it is particularly software. E*X*tensible *B*usiness *R*eporting *L*anguage (XBRL) developed as de-facto standard for data exchange for internal and external parties. While for internal data exchange little progress was made in terms of standardization, for external reporting, regulators have unanimously pushed XBRL (Cohen et al., 2005). To make data more accessible and more readable, regulators impose flexible "transparency technology XBRL (e*X*tensible *B*usiness *R*eporting *L*anguage)" (Sunstein, 2013) in the digital age. It is part of the choice architecture on regulation by governments (Sunstein 2013), which applies nudging for influencing towards a preferred option. XBRL was not originally invented by behavioral economists, but by a Certified Public

Accountant (CPA) named Charles Hoffman in 1998 and represents an open standard for electronic reporting and the exchange of data (Cohen, Schiavina and Servais 2005; Mirsch, Lehrer and Jung 2017; Sunstein 2013; Weinmann, Schneider and vom Brocke 2016) and should enable a democratization of the information access. XBRL inevitably requires the usage of an adequate taxonomy (Kurt and David 2003). The taxonomy development in the context of XBRL considering the academic literature reflects the following objectives:

- Enable the investors to receive corporate information, which are technically readable and comparable information based on country-by-country or sector analysis and thus improve transparency (Arnold et al., 2012)
- Enable the preparers to fulfill compliance requirements set by regulators, in terms of disclosing information in accordance with local and international rules (Piechocki, 2009)
- Improve the financial and non-financial communication by enabling adoption of specific branch requirements of industry (banks, insurance etc.) and of business variations (Swanson et al., 2007)
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However, XBRL is bounded to a taxonomy (Piechocki and Felden, 2007) as functionality is only guaranteed with the existence of a taxonomy (Debreceny et al., 2009). Given the complexity of principles-based taxonomies, AI can achieve a better representation between the taxonomy and underlying regulations (Mwilu, Prat and Comyn-Wattiau 2015) due to enhanced learning curves and computational power. According to most recent literature (Zhang et al., 2018), behavioral economics approaches are

applied to solve the representation issue for financial reporting with principles-based taxonomy. Such issues in accounting cannot be solved with standard-conventional techniques. This implies a democratic accountability, which is also enabled by the recent advances in information technology.

The structure of the article is that in a first step the foundation of blockchain and XBRL is explained and in general a taxonomy is defined. In a second step a literature review is performed which at the beginning summarizes the expressed views on the taxonomy development and principles-based standard setting. What can in the literature be found about blockchain and XBRL for accounting purpose. The main question is if XBRL and blockchain are explained in the literature as cooperative or non-cooperative.

2 Foundation of Blockchain

Blockchain technology ensures the elimination of the so called double-spend problem, with the help of public-key cryptography, whereby each agent is assigned a private key (kept secret like a password) and a public key shared with all other agents. This public-private key method is not new developed for blockchain, but also used e.g. for the exchange of data with cryptography secure technology. A transaction is initiated once the later owner of the coins (or digital tokens) sends his/her public key to the original owner. The coins are transferred by the digital signature of a hash. Public keys are cryptographically generated addresses stored in the blockchain. Every coin is associated with an address, and a transaction in the crypto-economy is simply a trade of coins from one address to another. The striking feature of the blockchain is that public keys can never be traced back to a real-world identity. Transactions are traceable, however one's

identity; this is a major difference with transactions in non-crypto currencies that, with the exception of (non-traceable) cash transactions, are related to specific economic agents endowed with legal personality (whether physical or juridical).

The blockchain is a chain of transactional records that a subset of network participants (also known as 'miners') enriches by solving difficult computational problems. Miners fiercely (and anonymously) compete on the network to solve the mathematical problem in the most efficient way, thereby adding the next block to the blockchain. The block reward (i.e. newly minted coins) is sent to the miner's public address. If the miner wants to spend these coins, (s)he must sign with the corresponding private key.

3   Foundation of XBRL and the development of taxonomies

E*X*tensible *B*usiness *R*eporting *L*anguage is an international information format with the aim to exchange business information. Structured electronic reporting is without a taxonomy not possible. To develop a taxonomy is not something first invented by the upcoming electronic reporting. In fact, developing a taxonomy, which is a synonym for classification, has a long history and can be traced back even to the origin of human language (Beerbaum, 2015). The word "taxonomy" has its origin in the Greek verb "taxis", which means "classification", and the noun "nomia", which can be translated as "law". Combined and interpreted, it means "laws of classification" (Sharma et al., 2008).

Contrary to the worries of the national standard setters there are many sources in the academic literature, which emphasize the advantages (Roohani et al., 2010) and added value of structured electronic reporting using XBRL (Alles and Debreceny, 2012; Beerbaum, 2015; Piechocki, 2007). Structured electronic reporting

- facilitates user-driven data standardization and improves comparability

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- provides computer-readable and complete disaggregation of disclosures

- improves efficiency

Taxonomies are dictionaries for example for IFRS disclosure requirements, for which elements and relationships are defined based on the specific legislation and standards. XBRL has developed from a simple transmission log file for financial information into a comprehensive flexible set of technologies and represents the de-facto standard for the digital exchange of financial information (Piechocki and Felden, 2007). Through its flexible extensible structure it enables data modeling (and more importantly, multidimensional data modeling with XBRL Dimensions), financial data querying and setting of business rules (XBRL formulas) and also the visualization of business information (Inline XBRL and XBRL rendering). "Extensible" is one element of the XBRL, which describes the important advantage to add elements which are not founded in the base taxonomy, but are required e.g. due to local or industry specific requirements. Additionally, once the relationship between elements considering their order, addition or deletion needs to be changed this also requires to set up an extension, which are also named company specific elements (Debreceny et al., 2011).

The IFRS taxonomy enables companies to prepare financial statements to be fully compliant with the set standards and the requirements of regulators. It is comparable with an illustrative disclosure checklist, however with the difference that the investor will receive the result of the disclosure checklist, as XBRL taxonomy is part of the external submission.

4   Bitcoin as an application of Blockchain

The Bitcoin algorithm is not a definitional feature of the blockchain, but a mere application thereof (Research, 2018).

Bitcoin was developed in 2007 – 2009. A white paper titled "Bitcoin : A peer-to-Peer Electronic Cash System" was published under the pseudonym Satoshi Nakamoto (Nakamoto, 2008), however up to today the source is unknown.

Bitcoin can be structured into a non-state currency and also which follows a non-state payment system. Bitcoin is dependant upon the internet and implies a decentralised structure. This is a material difference to national and state currencies. New bitcoins can only founded by private miners who supply the money and receive bitcoins in exchange. Those miners have the task of the verification of bitcoin transactions between users, so to enable the safe transfer of bitcoins from one user to the other. To be able to perform this tasks the miner need to know all ever executed bitcoin transactions. The past transactions are included in the blockchain. As part of the verification process the new transaction is included in the blockchain. Therefore, the miners and the blockchain provide the backbone of the infrastructure for bitcoin transactions.

We have previously exposed the core concepts of the blockchain, and alluded to Bitcoin, which is today one blockchain-based platform amongst others, although it still is the most famous worldwide. For Vitalik Buterin (Buterin, 2015) the blockchain is magic computer which can upload programs by everyone to and leave the programs to self-execute, where the current and all previous states of every program are always publicly visible, and which carries a very strong crypto economically secured guarantee that programs running on the chain will continue to execute in exactly the way that the blockchain protocol specifies.

Key characteristics of the blockchain are an open-source community, which maintains the bitcoin protocol, which implies the coded rules behind the bitcoin.

The system is not controlled or supervised by regulators, as it is based on an incentive structure. This implies that programmers are rewarded for compliance

with the rules. This is also applicable to miners and users. With such a reward system the system's stability is intended to be achieved.

5   Global development of XBRL filings and main issues identified

This chapter analysis the development of XBRL files in the last years.

Although the number of countries adopting IFRS have increased largely in the last ten years, the number of XBRL filings were dominated by US GAAP filers. This relates to two facts. The SEC very early requested on a mandatory basis interactive filings with XBRL (Debreceny et al., 2005). The requirement was only applicable for US GAAP filers, while IFRS filers were not required until this year. SEC accepted in 2017 the IFRS taxonomy (Beerbaum et al., 2017).
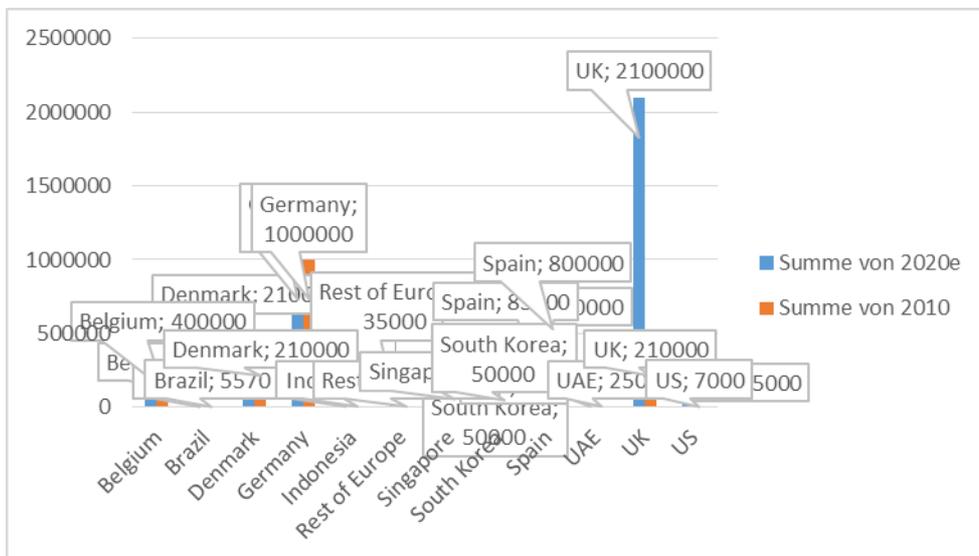
Figure 1.1 US GAAP versus IFRS XBRL Filings

US GAAP vs. IFRS XBRL Filings
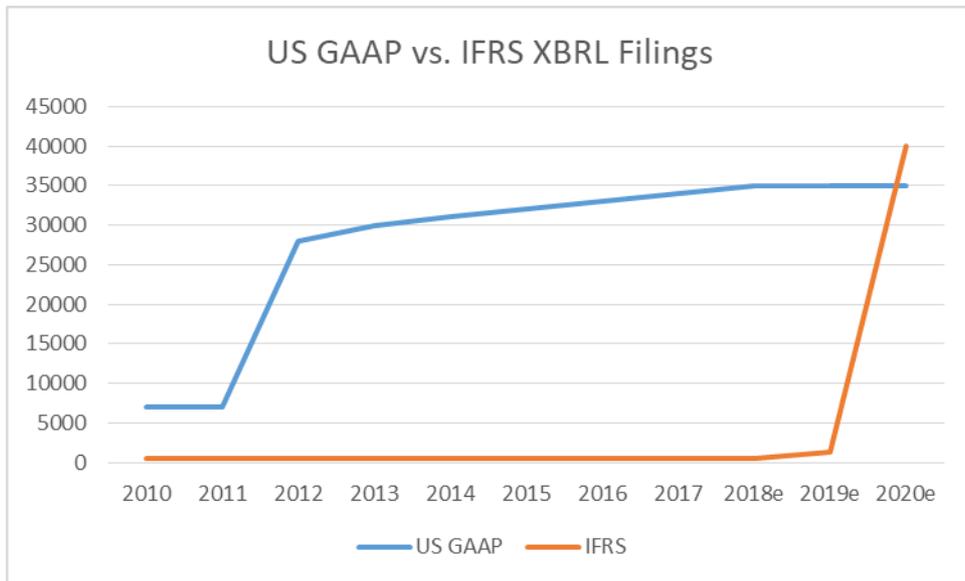
Source: XBRL.org, World Federation of Exchanges and own estimate

The following figure shows the distribution of XBRL filings among different countries.

Figure 1.2 Development of XBRL Filings by countries between 2010 and 2020 (expected)

Source: XBRL.org, World Federation of Exchanges and own estimate

6 Literature about XBRL and blockchain

Going through the literature about XBRL and blockchain, the literature is very rare on both combined subjects. Most of the sources are available in form of conference papers, which shows that the subject is much discussed but it still take time that literature become available in peer-reviewed journals.

Dominant topics in the existing literature about XBRL and blockchain are the following:

- Continuous auditing and verification with XBRL blockchain (Dai, 2017, Chan et al., 2018, Deloitte, 2018, Dai and Vasarhelyi, 2017)

- Real-time accounting and reporting with XBRL combined blockchain (Byström, 2016, Trigo et al., 2014)

- Acceleration of time with the XBRL blockchain (Colgren, 2018, Monterio, 2016)

- This article and demo explains how to build a distributed ledger platform prototype from the ground up, specifically designed to manage financial reports, in the line of other proposals in the financial area.(Boixo et al., 2019)

- Design and implementation of a prototype to validate and store financial statements using Ethereum blockchain (d'Atri et al., 2019)

Concluding from that the academic literature is still in its early stage to issue articles about the topic. As the topic is very much driven by the new technology of blockchain it will take more time until more literature will be made public.

7 Application of Blockchain to XBRL filings

Blockchain could be te next step in digital accounting and represent a Game Changer (Monterio, 2016, Dai and Vasarhelyi, 2017) also due its disruptive characteristics (Jung and Plazibat, 2017). The following advantages are seen with Blockchain for accountants and auditors:

- Validation of postings

- Verification of financial nad non-financial information

- Acceleration of time

These advantages are confirmed by a paper from Deloitte (Deloitte, 2018). In the study from Deloitte the authors focus on the aspect of verification without having

the obligation to rely on a trusted third party. Companies have the possibility with blockchain to write their transaction directly into a joint register. This would be revolutionary comparable to cloud computing or banking, in which both data or money is not any more treated in-house but provided to a third party. creating an interlocking system of enduring accounting records. "Since all entries are distributed and cryptographically sealed, falsifying or destroying them to conceal activity is practically impossible. It is similar to the transaction being verified by a notary – only in an electronic way." according to Deloitte.

XBRL enables structured data, which is a prerequisite for machine readable blockchains (Monterio, 2016, Swan, 2015). With that XBRL and blockchain can form a kind of "products symbioses", as this is known from biology. Bockchain will become more efficient, if XBRL provides high-quality structured data. XBRL has the advantage as it represent the de-factor standard for the electronic exchange of financial and non-financial information and ensures that along the financial supply chain stakeholders machine to machines can communicated efficiently without any data breaks. The expectation by the market are very high given the vast investments in blockchain infrastructure projects.

Speed is a next domain, in which blockchain and XBRL have its real advantages. Accounting processes can vastly automated while control and audit costs will decrease due to the built-in validation. XBRL combined within a blockchain has the potential to enable real-time reporting and real-time accounting, as stakeholders can directly access to blockchain accounting information.

8 Conclusion

Blockchain is one of the biggest technological hypes in the last years. The extent is comparable to the internet hype during millennium. XBRL was a hype but

reached now universal application. Millions of XBRL files are produced and its technology is vastly distributed. The combination of both enables new opportunities and the following advantages validation, verification and acceleration of time. The future literature should focus on answering questions about the feasibility of combining XBRL with blockchain. How can blockchain ensure that high security requirments are met. What is the incentive for companies to provide accounting information into blockchain?

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