

A Database Exploring Blockchain and Real Estate



Jan Veuger

Abstract The Foundation for International Blockchain and Real Estate Expertise (FIBREE) was founded in Amsterdam in 2018 with the aim of bringing together real estate professionals and blockchain specialists from all over the world to exchange expertise. FIBREE is aware of the current hype about blockchain technology, which does not always contribute to getting to know it better. FIBREE's mission is to help create a realistic expectation pattern that will allow the real estate market, step by step, to discover and exploit the true potential of blockchain technology. By bringing together the expertise of pioneers in this field and sharing knowledge and insights already gained, FIBREE wants to make an important contribution to the adoption and implementation of this technology in the real estate market in the coming years. This article provides an overview and analysis of all relevant scientific publications in the Netherlands, and does so within a context of a first small international exploration of international research, experts and products.

Keywords Blockchain · Real estate · Database · Research · Products · Experts

1 Introduction

There are some arguments for development the foundation as an international platform of professionals for professionals which is objective, neutral and integrity as core values. There is a growing network of 2000+ professionals who share an interest in blockchain and real estate with partnerships with relevant professional business organizations and platforms. FIBREE works in a decentralized structure: participants set the agenda by regional representatives. Together they create a realistic perspective on the applicability of blockchain in the real estate industry. In this

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article I look at a study that was carried out in 2018 to give an idea of the state of affairs regarding blockchain in real estate across five continents and 63 regions to the extent that this was public at the end of 2018.

2 Covering and Regional Chairs

Since the beginning of 2018 FIBREE has been developing a global network regarding blockchain and real estate on three different perspectives: research, experts and products. In total FIBREE is working on covering 63 regions and 5 continents: Eurasia (consisting of the continents of Asia and Europe), Africa, America (North and South America), Antarctica and Australia. On the reference date 31 December 2018, 24 regions—38% of the target number of 63 regions—are represented in this study, in which Europe is strongly represented with 14 regions or 58% of the participating regions (Table 1).

Table 1 Covering country, continent and region

Target country	Continent	Region
Austria	Europe	Vienna
Austria	Europe	Graz
Brazil	America	Sao Paulo
Croatia	Europe	Zagreb
Georgia	Europe	Tibilisi
Germany	Europe	Berlin
Germany	Europe	Stuttgart
Germany	Europe	Frankfurt
India	Asia/Pacific	Bangalore
Israel	Middle East	Tel Aviv
Italy	Europe	Milano
Netherlands	Europe	Amsterdam/Enschede
Poland	Europe	Warsaw
Slovenia	Europe	Ljubliana
Switzerland	Europe	Zug
Taiwan	Asia/Pacific	Taipeh
The Netherlands	Europe	Amsterdam
United Kingdom	Europe	London
USA	America	New York
USA	America	North America
USA	America	Seattle
USA	America	Chicago
USA	America	New York
USA	America	Silicon Valley

3 Methodology Worldwide and The Netherlands in Particular

The Regionals Chairs (RC) were asked to collect data on (1) which blockchain and real estate product-suppliers or initiatives do you see, (2) which research-output on blockchain and real estate do you have and know and (3) who are the experts with which specific expertise in the field of blockchain and real estate that you see?

The research looked for the combination of blockchain and real estate in the output of the various universities for research. The data collection started in mid-2018 and ended in December 2018. In January and February 2019, the analyzes were carried out centrally and in co-ordination, with some checks being carried out at the RC. The data collection does not include the announcements and reports of seminars, conferences and meetings, as well as duplications in professional journals. It has also been observed with some regularity that publications were no longer available in the libraries and gave an error message. The data collection for research in the Netherlands took place at all universities (of applied sciences) to which a real estate course is linked or related. In the public or non-public libraries, the data collection took place whereby it should be noted that much was public, but not everything (Table 2).

Table 2 Overview of libraries of universities (of applied sciences) in the Netherlands with a real estate course or subject related thereto

University	City	Source	Hits
Amsterdam School of Real Estate	Amsterdam	Public	5
Delft University of Technology	Delft	Public	25
Eindhoven University of Technology	Eindhoven	Public	80
<i>Fontys University of Applied Sciences</i>	Eindhoven	Not public	0
<i>Hanze University of Applied Sciences</i>	Groningen	Not public	0
Maastricht University	Maastricht	Not public	0
Radboud University	Nijmegen	Not public	0
Rotterdam University of Applied Sciences	Rotterdam	Part Public	95
Saxion University of Applied Sciences	Enschede	Public	23
Tias Business School	Tilburg	Public	491
University of Groningen	Groningen	Public	24
University of Amsterdam	Amsterdam	Public	47
University of Twente	Enschede	Public	10
Utrecht University	Utrecht	Not Public	0
Wageningen University and Research	Wageningen	Public	29
Total Dutch universities			829

4 Conclusions Research The Netherlands

The database of the Netherlands has a scale of 131 virtually one hundred percent score on the parts author, title, company name or university, research—product—expert, level, subject, country, publication year, keyword and link. The accrued database thus amounts to 16% (n = 131⁸²⁹) of the hits found that have been stripped of regular announcements of seminars, master classes, press releases, news items, opinions and columns. Within the database, a distinction has been made between General or Real Estate because a number of articles do contain material about blockchain and real estate, but most of them are about blockchain in general. From this perspective, 59% (n = 77¹³¹) are fully focused on real estate and blockchain (Fig. 1)

If we fully analyze the database that has been built up, the following figures will be published on numbers of publications in company name of (applied) university, numbers of publications levels, number of publications by topic, number of publications by country, publication year, keywords and most common authors.

4.1 Company Name or University

Of all 131 publications, a total of 82 universities in the Netherlands, with several producing only one or two publications. When these are excluded from the analysis, it appears that much can be traced back to the libraries of Tilburg University (24 publications), Rotterdam University of Applied Science (18 publications), followed

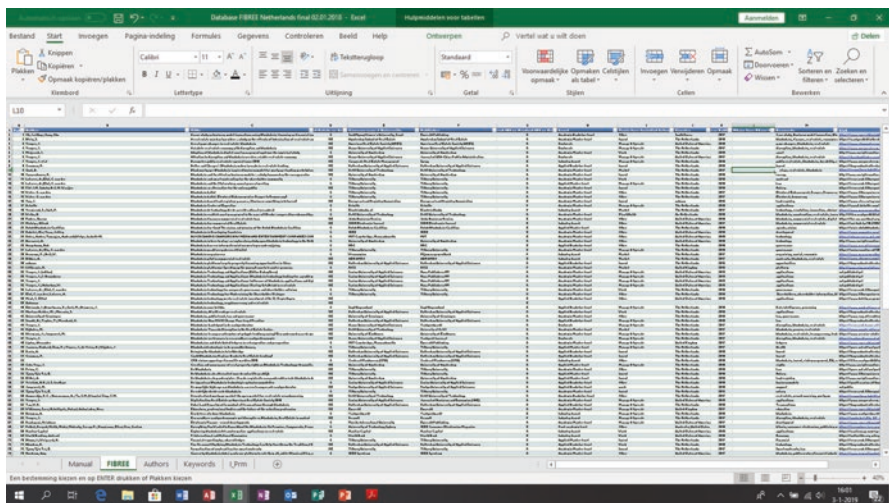


Fig. 1 Example of the database Research The Netherlands

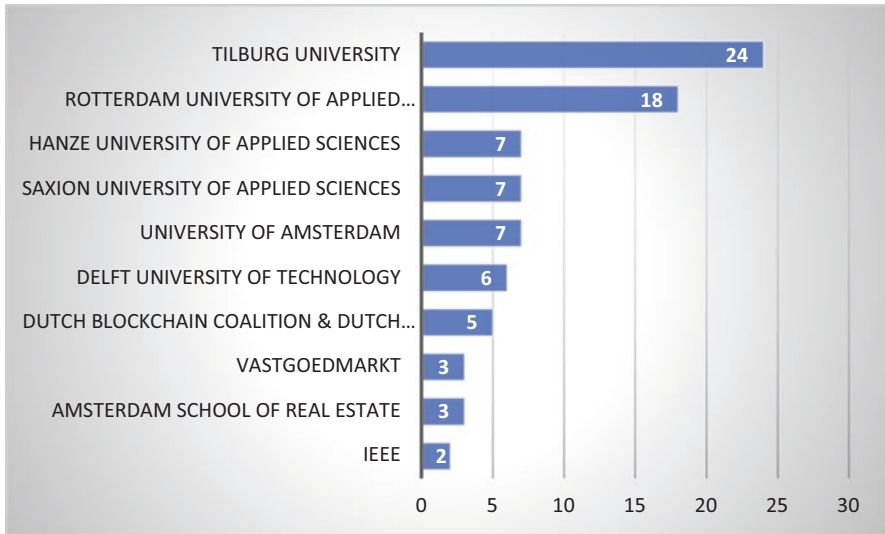


Fig. 2 Number of publications in company or (applied) university

by Saxion University of Applied Sciences (7 publications), Hanze University of Applied Sciences (7 publications) and University of Amsterdam (7 publications). As far as is known now, there is no PhD research in the Netherlands in the area of Blockchain and Real Estate in 2018 (Fig. 2).

4.2 Levels

The level of publications is high, especially at the academic master level ($n = 64^{131}$), followed by industry-based ($n = 30^{131}$), applied bachelor's ($n = 21^{131}$) and master's level ($n = 10^{131}$). This means that the academic level is high and the industry is also explicitly present in the field of publications (Fig. 3).

4.3 Topics

The topics are mainly in themes such as Manage and Operate, Invest and Work, together a share of 65% ($n = 84^{131}$). The topics of the publications are in sequential numbers: Manage and Operate 35% ($n = 45^{131}$), Other 25% ($n = 32^{131}$), Invest 17% ($n = 22^{131}$), Work 13% ($n = 17^{131}$), Market 9% ($n = 12^{131}$) and Plan and Build 2% ($n = 3^{131}$) (Fig. 4).

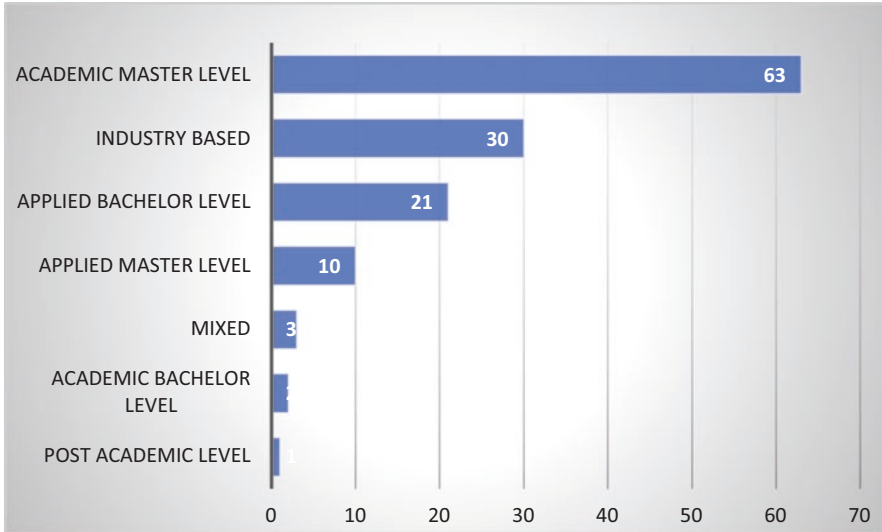


Fig. 3 Number of publications per level

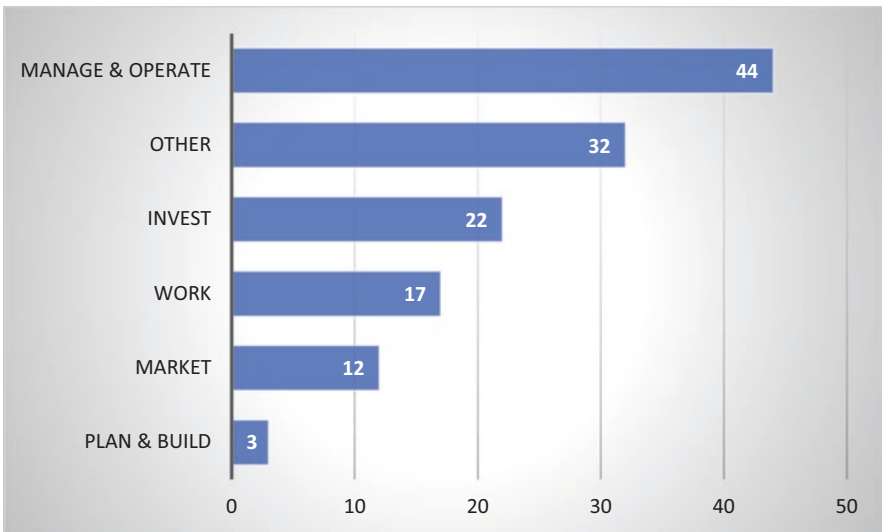


Fig. 4 Number of publications per Topic

4.4 Countries

The Netherlands is strongly represented in the number of publications, but in view of the demarcation of the working area of universities and applied universities in the Netherlands, this is not a special feature. However, the influence of the United

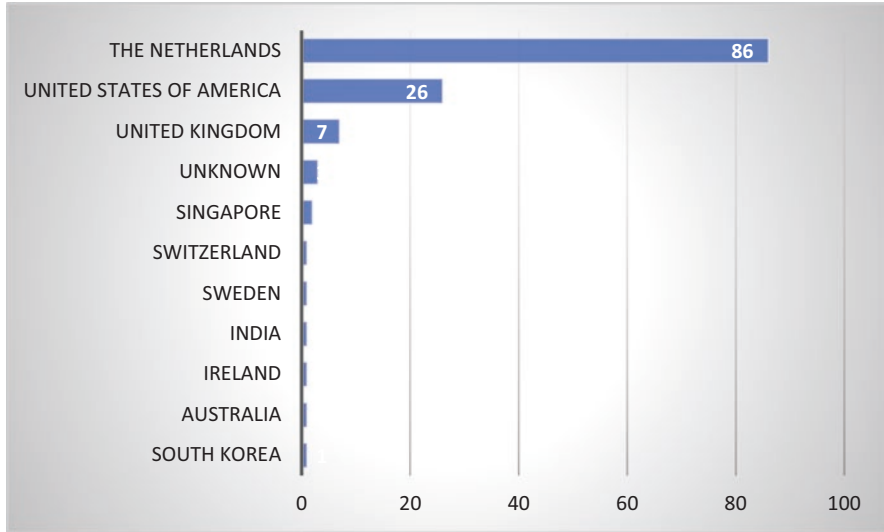


Fig. 5 Number of publications per Country

Kingdom and The United States of America compared to all other countries in the table below is clearly visible in this database (Fig. 5).

4.5 Publication Year

When we look at the Years in which the publications took place, in 2018 the number of explosives has risen in relation to the previous year 2015–2017. This study shows that 55% (n = 72¹³¹) of the publications appeared in 2018 compared to 36% (n = 47¹³¹) in 2017 and 4% (n = 5¹³¹) in 2016 and 1% (n = 1¹³¹) in 2015. At the start of 2019, a number of (4%) publications are already visible (n = 5¹³¹). The attention in publications about Blockchain and real estate has mainly developed in 2017 and will continue in 2018. Given the upward trend, it is interesting for a follow-up study into how 2019 will develop in this area.

4.6 Keywords in a Word Cloud

The 131 databases from which this research is based have been added as far as possible. When these are included in a word cloud and the most common words in size of the word become visible, the following figure and image will appear. This shows that besides blockchain, technology, estate and disruption, the words governance, public, energy, economic, management, invest, finance and registry are very common (Fig. 6).



Fig. 6 Keywords in a cloud

4.7 Most Common Authors

The database shows that the most common authors are Veuger and co-authors 10% (n = 15¹³¹), Tjong Tjin Tai 5% (n = 7¹³¹), Lafarre and van der Elst 3% (n = 4¹³¹) and Dutch Blockchain Coalition and Dutch Digital Delta together are 4% (n = 5¹³¹). A substantive analysis of these authors shows that their focus is on vision, agenda, organization meetings, notaries, contracts. Legal business application possibilities in general to real estate and blockchain. Specifically, this can be described per author in alphabetical order as follows.

The Dutch Blockchain Coalition (DBC) and Dutch Digital Delta, two affiliated organizations, mainly published their mission and vision (*Blockchain for Good, the vision and mission of the DBC*, 2018), the knowledge and innovation agenda (*Knowledge and Innovation*, 2018), *Agenda ICT 2016–2019* (2017), in anticipation of further elaboration of its plans in the *Legacy Coalition* (2017) and smart contracts as a specific application of Blockchain technology in 2017–2018. The Dutch Blockchain Coalition is a public-private partnership of partners from financial services such as banks and insurance companies, the logistics, energy, security and ICT sectors, ministries, the knowledge world, supervisory parties such as the Netherlands Authority for the Financial Markets (AFM)) and the Royal Dutch Notarial Association (KNB) and organizations such as TNO, NWO and ECP I

Platform for the Information Society. The coalition is an initiative of the Ministry of Economic Affairs and Climate. Dutch Digital Delta is the meeting place to connect and create. It is a national platform, intended for everyone involved in technological innovation.

All publications of dr. A.J.F. Lafarre LL.M. MSc (professor of law Tilburg University with the expertise on corporate governance, law and economics and shareholder meetings) en prof. dr. C.F. van der Elst (professor of law and management of Tilburg University with the expertise business transactions, corporate governance, enterprises, law and economics, and legal persons law) were published in 2018 and are mainly about the organization around the application of Blockchain for meetings: *Blockchain and smartcontracting for the shareholder community* (2018), *Blockchain and the 21st century annual general meeting* (2018), *Blockchain maakt vergaderen efficiënt* [Blockchain makes meetings efficient] (2018) en *Blockchain for corporate governance and shareholder activism* (2018).

Publications of Prof. T.F.E. Tjon Tjin Tai (professor at Tilburg University with private law, law of civil law and IT law) mainly has Invest topics with attention to notary, contracts and law: *The blockchain as an alternative to the notarial practice* (2018), *The reasonable third and Blockchain* (2015), *Formalization of contract law for smart contracts* (2017), *Legal aspects of blockchain and smart contracts* (2017), *Legal Issues on Blockchain and contract* (2017), *Smart contracts and the law* (2018) and *The reasonable third party and the Blockchain* (2018).

In 2017 the research *A viable real estate economy with disruption and blockchain* has done by dr. ing. J. Veuger MRE FRICS (professor Blockchain of the School of Finance and Accounting, School of Creative Technology and School of Governance, Law and Urban Development of the Saxion University Enschede and therefore from 2012 to 2019 professor Real Estate Hanze University) which submitted other new publications and presentations: *A viable real estate economy with disruption and Blockchain as a book* (2017), *Attention to disruption and Blockchain creates a viable real estate economy* in the Journal of USA-China Public Administration (2017), *Blockchain: kantelpunt in de vastgoedsector* [Blockchain: turning point in the real estate sector] (2017), *Blockchain: vertrouwen in een wendbare vastgoedeconomie* [Blockchain: confidence in a maneuverable real estate economy] (2017), *Een wendbare vastgoedeconomie met disruptie en Blockchain* [An agile real estate economy with disruption and Blockchain] (2017), *Noordelijk Vastgoedcongres 2017: disruptie, blockchain en vastgoed* [North Real Estate Congress: disruption, blockchain and real estate] (2017) en *The true meaning of the Blockchain technology for real estate still needs to be investigated* in International Journal of Engineering and Sciences (2017). In 2018 is the before mention research presented on the American Real Estate Society (ARES) Congress 2018 with the title *A real game changer in real estate: blockchain* (2018)—and wins the Manuscript Prize Competition in category Property/Asset management American Real Estate Society (ARES) 2018—and on Barometer Maatschappelijk Vastgoedcongres [Barometer Social Real Estate Congress] (2018) in de publication *Barometer public real estate: special issue* (2018). In 2018 is also the article *Trust in a viable real estate economy with disruption and blockchain* published in the Journal Facilities,

subject area Property Management and Build Environment. The full text of this document has been downloaded almost 2.000 times since 2018. In May 2019 the scientific peer reviewed book *Blockchain Technology and Applications* appeared by Veuger as editor of eight chapters and (co)writer of three articles: *Blockchain technology looking for a problem in real estate* (Veuger & Bronckers, 2019), *Influence of blockchain applications and digitalization on real estate* (Veuger, 2019a, b, c) and *Start up GetaBrick in real estate* (Veuger & Hulsebos, 2019). A publication of Nova Science Publishers New York was announced in May 2019 but has supposed to published in 2018.

5 Conclusions

5.1 Conclusion 1

Never before has an investigation been conducted on such a scale about the state of affairs of publicly available information about blockchain in combination with real estate. However, it should be noted that this is a snapshot on 31 December 2018 and is not necessarily exhaustive. This research should therefore also be seen as a first step for further (annual) research.

5.2 Conclusion 2

A follow-up study is necessary for further complementation and the best possible completeness of the database and the development and sharing of knowledge in the field of research, experts and products. The system and methodology of this study has shown that this method can provide the right information and can therefore be used to further broaden the scope of the study worldwide.

5.3 Conclusion 3

Finding innovative configurations for business models for the real estate sector is not easy when using blockchain technology. A distinction can be made between three platform generations: (1) Bitcoin, (2) blockchain platforms and (3) network of allowed participants. The first variant is not suitable for the real estate sector due to the fact that it is not possible to exchange assets other than token and currency than, for example, contracts. The second generation platform is mainly focused on improving exchange opportunities. This has led, among other things, to the development of smart contracts in an Ethereum network that is aimed at a global and public

network where all transactions are visible. The third-generation platform is accessible to admitted participants and they are therefore the only ones who have insight into this network. Corda (www.corda.net) is an example of this.

5.4 Conclusion 4

Limited research has been done into the influence of blockchain technology in the real estate sector (Veuger, 2018, 2019a, b, c). Studies by Dijkstra (2017) and Gout (2017) provide an initial exploration (Veuger, 2017a, b, c, d, e, f, g, h). Dijkstra (2017) concluded that blockchain can add five values to real estate management (1) a building passport, (2) alternative financing options, (3) trading real estate by the blockchain, (4) smart leases and (5) sustainability applications. Gout (2017) concluded that a possible application of blockchain technology could be used when setting up Marketplace funding.

5.5 Conclusion 5

The real estate chain is a highly fragmented chain with many information exchanges between a large number of involved parties, as well as traditionally many data silos and a large diversity in standards and used software protocols. The real estate chain can be roughly divided into five information domains (Veuger and Bronckers, 2019), with the identity of the building or building part as connecting factor. If the various actors are then also projected, it should not come as a surprise that tedious communication and information exchange is among the top complaints. And that is exactly where blockchain shines, as we just discussed in being able to trust that everyone has the same information. In other words, many use cases are conceivable, but who will allow parties to not only communicate better, but also make them want to communicate? The real estate column lists various national or international, established or new standardisation initiatives, such as Oscre,¹ Redex,² Vastgoedtaxonomie,³ BIMchain,⁴ NEN,⁵ ISO,⁶ et cetera. These standards provide uniform definitions, data, protocols or IDs within the scope of the specific field of application, which is often still a silo. In other industries, such as the automotive⁷ or

¹<http://www.oscre.org/oscreblockchaininitiative>

²www.redex.nl

³Website SBR Banken

⁴www.bimchain.io

⁵Website smartindustries / NEN

⁶Website ISO

⁷www.dlt.mobi

the international transport industry,⁸ the same issue is at hand. Broad consortia are now established to settle barriers, since they want to take maximum advantage of the blockchain potential. Why should this be different for the real estate column? Is it not time that parties who consider themselves trend setters to unify and take the initiative? As history as taught us, new technology for a broadly applicable administrative foundation can lead to revolutionary business models. L'Histoire se repète. Will time tell? (Veuger and Bronckers 2019).

5.6 Conclusion 6

The way in which disruption, Blockchain and real estate will develop in the coming years are not the only obvious characteristics of a particular era, but also its social impact and user behaviour. This also applies to how this real estate transition can best be tracked, guided and utilized in society at the international, national and regional level. Disruptive organizations clearly respond to the viability of the (built) environment and therefore determine competitive strength. This affects the current and future valuation of real estate. The value of the possible applications of Blockchain in real estate processes is reflected in more effective and efficient transactions, increasing transparency, a better foundation for investment and new development for the mortgage market. All of this will then grow into more trust in fundamental elements of an economy: land and real estate and from the 'internet of things' to an 'economy of things'.

Looking at the impact of Blockchain on real estate, we can draw a number of conclusions. First of all, the relationship between Blockchain and real estate has not yet been proven in practice. It is expected to develop further in the form of registering transaction processes and the DNA passport of a real estate object. Secondly, completeness and transparency are the basic ingredients for trust in the system. Third, real estate wants to remain viable. For this reason, taking the offense is necessary for real estate and management to connect with social demand. Behaviour also leads to new earnings models of the social and economic spin-off of disruptive real estate. If the Dutch real estate sector embraces Blockchain and is able to realize innovations, then there are opportunities for real estate entrepreneurs to exploit the disruptive character to provide those new services. Artificial intelligence through algorithmizing of Blockchain will increasingly play a role in the taking of decisions by learning organizations. It is good to realize that (thinking) processes and decisions are being outsourced by algorithms. This artificial intelligence cannot combine hard and soft factors to make considerations. The question is whether we will use the big-data models correctly and not inadvertently bring about inequality, discrimination and less vigilance. That technology develops faster than the adaptability of people is also not new: the parachute was invented before the first plane flew.

⁸ www.bitastudio

Ethics for individuals and organizations remain important for judging and utilizing data.

Changes in value concepts affect the valuation of real estate and the thinking about it. The orientation of changing users and owners of real estate affects innovativeness, values and flexibility in managing that property. Orientation on disruption must be seen as proof that the real estate world is able to actually innovate the accumulated assets and consolidate this. The financial and real estate markets are markets that exaggerate through irrational behavior. Fear of 'eat or be eaten' determines people's behavior. Financial and thus real estate markets are always unstable and must always be regulated by people and organizations.

The question that remains is whether it is important to look at disruptive innovations in existing markets or newcomers in the real estate market and Blockchain. The question is whether Blockchain is only a technological disruption, or a real game changer, and whether the entire value chain of the real estate market will embrace it. No two disruptions are the same. Trust in Blockchain is a prerequisite for guiding the predictable form of that disruption where start-up companies use new technology to offer cheaper and inferior alternatives to real estate in the market (Veuger, 2017a, b, c, d, e, f, g, h).

5.7 Conclusion 7

Blockchain could have a huge impact on the value chain in our society. Examples are efficiency, transparency, ownership, value (transfer), automation and service provision. When we want to understand the world of blockchain, we need to understand the innovation of the currency Bitcoin in 2009 that is built on underlying technology called Blockchain. Bitcoin is a combination of four individual elements: (1) cryptography, (2) a peer-to-peer network, (3) an open source protocol and (4) a shared ledger. This makes it a phenomenon that people are enthusiastic about. The internet already makes it possible to transfer information quickly, cheaply without paper and without intermediaries being involved.

Blockchain gives the same benefits for transferring values. Internet is used to transfer word and image, blockchain for transactions. Blockchain is a combination of two elements: a shared and distributed ledger with synchronized data spread over multiple sites, countries and/or institutions and a cryptography: digital token with a monetary value. This book provides an overview of the latest developments on blockchain technology and its applications with the following themes and with the assistance of experts from Austria, Brazil, China, Croatia, Georgia, Germany, Italy, Netherlands, Slovenia, Spain and Switzerland: (1) *Blockchain and the Agenda 2030* by Danielle Mendes Thame Denny, (2) *Application of Blockchain Technology in the Field of E-Government Services* by Jiarui Zhang, (3) *Can the Cybersecurity of Smart Building be Improved Using Blockchain Technology?* by Ben van Lier, (4) *Influence of Blockchain Applications and Digitalization on Real Estate* by Jan Veuger, (5) *Blockchain: Technology Looking For a Problem in Real*

Estate? by Jo Bronckers and Jan Veuger et al., (6) *Start up ‘Get a Brick’ in Real Estate* by Wendel Hulsebos and Jan Veuger, (7) *Blockchain: An Efficiency Solution For Housing Associations?* by Michel Vonk, (8) *Blockchain Applications in Support of the Energy Transition* by Mieke Oostra and Jelle Rijpma, and (9) *Many Keys of Blockchain for Real Estate* by Esther Dekker (Veuger et al., 2018).

5.8 Conclusion 8

A question that remains is to continue to look at existing markets or to disruptive innovation newcomers in the blockchain market. The question is whether blockchain is only a technological disruption or a real game changer and whether the entire value chain of the market is going to embrace this. Confidence in blockchain is therefore a precondition for guiding that disruption where (new) companies use new technology to offer cheaper and superior alternatives in the market. But the big question is how quickly blockchain will develop as well as all its applications (Veuger et al., 2018).

6 Overall Conclusion

The way in which blockchain and real estate will develop in the coming years are not the only obvious. The true meaning of the blockchain technology for real estate still needs to be investigated. I am still curious to understand and clarify the value of Blockchain for real estate processes. Doubt continues to exist and is therefore a feeding ground for further research, because we do not know what we have not seen.

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Jan Veuger, MRE, FRICS, was appointed in 2019 as professor of Blockchain of the School of Finance & Accounting, School of Creative Technology and School of Governance, Law and Urban Development, Hospitality Business School and School of Commerce and Entrepreneurship of the Saxion University of Applied Sciences Enschede, The Netherlands. Previously, he was professor of Real Estate at the Hanze University of Applied Sciences, Groningen, Institute for Business, from 2012 to 2019. Jan graduated from the Erasmus University Rotterdam, one of Europe's top business schools for education and in the top three for research. Besides being a professor, Jan is co-promoter of several students, Chairman of the Committee of Quality Certificates (CKV) at Quality Center for Social Housing Corporations, and member of Supervisory Board of Commissioners for four different organizations (to 2000 employees) in the area of social housing and elderly care. Furthermore, he is member of the RICS Netherlands, Department of Research and Innovation, Fellow of the RICS, President of Academic Board FIBREE, and author of many books (chapters), international scientific and professional publications, syllabi, and research reports and has given many guest lectures.