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Influence of Blockchain in the Real Estate Sector

In Which Stage of the Buying Process of Commercial Real Estate can Blockchain Provide Added Value for the Stakeholders Involved?

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Abstract

The two primary characteristics of real estate assets are their heterogeneity and immobility. Because of these two factors, the market for buying real estate tends to be illiquid, localized and highly segmented, with privately negotiated transactions and high transaction costs due to the involvement of a vast amount of trusted third parties (Ling & Archer, 2013). Because of these characteristics, and the opportunities Blockchain offers, the buying process of commercial real estate, and the involved stakeholders could be affected majorly by this technological phenomena. The lack of transparency, high transaction costs and the need for digitalization in commercial real estate companies give Blockchain its game-changing potential. The results have shown that the pre-marketing phase and due diligence phase are most suitable for the implementation of Blockchain. This due to the characteristics of the phases, characteristics of the stakeholders and the characteristics of Blockchain. The main aspect here can be focused on the added value of Blockchain as a data sharing program which could add value creating a more safe and secure way of sharing data. What should be mentioned is that the technology is in an early stage of development and therefore not (yet) suitable for the implementation in the real estate sector. Although multiple pilots and user cases could be mentioned, the technology needs to overcome some obstacles to be a beter success in the current buying process of commercial real estate.

Keywords: blockchain, commercial real estate, added value, stakeholders

1. Introduction

The potential and influence of Blockchain on this buying process can also be described by the story of Maka de Lameilleure, head of research and development at the Antwerp Management School (Straub, 2018). She was told that her Georgian parents wanted to sell their house to her. She is telling that the Land Registry of Georgia has been working with Blockchain for about a year and that the notary in this buying process only was involved in the validation of the inserted documents. Because the notary only validated the documents, the total transaction costs were estimated on €162. The change of this way of working resulted in a major cost reduction.

This example gives us a good identification of the economic impact on the stakeholders of this technological phenomena. Christian Luyten, communication director of the Notary Federation of Belgium, also recognized the impact. He stated: 'Notaries in Georgia have contributed to the switch to Blockchain. Because the system eliminated exactly the work that required little intellectual effort, allowing the notaries to focus more on the more interesting and challenging tasks. We might lose some revenue due to the implementation of Blockchain, but we could earn more money due to the better focus on more complex dossiers' (Straub, 2018).

The literature and cases are examples of the endless possibilities and the impact on stakeholders in the buying process when using Blockchain. The Blockchain hype is getting more intense every day and more people are showing interest in the advantages of the topic. Due to the real estate process characteristics and the inefficiencies, we could say that Blockchain brings us a solution to improve these different factors. This research tries to grab on to this hype and will project the possibilities and risks of the Blockchain in the buying process of commercial real estate.

A side note which has to be made here is that the earlier given examples indicate that there is a problem or inefficiencies in the buying process. But is this really the case? Are there inefficiencies in the process which could be improved by the implementation of a Blockchain?

According to McNamara (1998), the most improvements which could be accomplished are defined in the last stage of the entire process. The so called due diligence process. McNamara (1998), mentioned 'However, it was at this stage that transactions are most likely to be delayed, sometimes dramatically due to four main factors (1) previously unknown or ignored inherent problems, (2) changes in the asset e.g. tenant default, (3) change in market conditions and (4) changes in the circumstances of the purchaser, for example difficulty of funding and the increasing use of debt was said to sometimes result in an additional due diligence process which could cause delay; and also re-assessment of the offer price.

Bosak, Mayer & Vogel (2007) are more focused on the transaction costs inefficiencies of the process. They are telling in their book, that the chapters of a due diligence/transaction process consist of real estate issues, legal issues, tax and accounting issues, and technical issues. These issues result in high transaction costs. They are saying: That the costs for a professional due diligence investment could get into the hundreds of thousands of euros.

These different sources give us an identification that there are some efficiencies in the process. According to these sources especially in the last part of the process. Because the different stages are related to each other an investigation is started to see where in this process Blockchain could add value. Because the main problem in the process seems to be in due diligence face the focus in this research will lay on the stages of the buying process in commercial real estate. This to limit the research to a certain extent, what makes it doable in the time given in this study and gives me the opportunity to make this research measurable.

A side note which has to be made here is that one could argue that previously unknown or ignored inherent problems and changes in the asset benefit the buyer's position in the buying process. Because these problems and changes will be reflected in the buying price of a property. So inefficiencies in the process benefit a particular stakeholder in the process because it has an effect on the price. It seems to have an economic value for this group. An implementation of a Blockchain seems in regard to this argument not logic for this group. This with the idea/argument that Blockchain improves the administration between certain parties.

On the other hand, you could also mention the argument that a buyer does not want to face surprises, firstly because this has an effect on the trust between buyer and seller. The lack of transparency in the real estate sector is a commonly mentioned argument. The social value of an implementation seems by this argument more important for the stakeholder. And secondly, and maybe even more important, because the buyer has devised a certain strategy when buying a real estate object. As you can see, this subject can be approached from different angles, and therefore valuable to research. The different types of value for the stakeholders are researched by Seuren (2018). More about this will be mentioned further on in this study.

The focus of this project lays thus with the exploration of the possibilities of integrating Blockchain in the buying process of commercial real estate. By analyzing the current buying process, insight into the possibilities and risks of implementing Blockchain will be accomplished. Besides the first mentioned focus, stakeholders in this process should provide insight into the defects of the buying process, to test the practical reality with the provided theory. By realizing this, we are better able to explain the obstacles in the process. In this way, we can find out where Blockchain offers added value for stakeholders involved in this process.

The provision of a scientifically based research document will present an answer/overview of the possibilities of Blockchain in this real estate process and will function as a trigger for the continuation of research into this topic with the question *In which stage of the buying process of commercial real estate can Blockchain provide added value for the stakeholders involved?*

The main drivers in this research will be the buying process of commercial real estate, added value, the stakeholders, and of course Blockchain. The impact of Blockchain on the buying process of real estate has not been researched (Veuger 2017, 2018). Besides the existing research is not based on the process level of buying commercial real estate. Existing research on Blockchain is mostly limited to the explanation of the phenomena of the technological trend and is not focused on the strategic use of companies. This research should fill in this knowledge gap and should contribute to the further investigation of this topic.

So, the research objective of this article is focused on exploring the different possibilities for integrating Blockchain in the buying process of commercial real estate, taken into account the different needs and wishes of the stakeholders involved. By analyzing the current transaction/buying process, gaining knowledge about the

implementation of the technological trend, and analyze the stakeholders involved exploring in which phase of this buying process can benefit from the use of Blockchain will be accomplished.

2. Problem Analysis

Blockchain was introduced back in 2008, by Satoshi Nakamoto. Nakamoto (2008), argued in this paper that the current financial system works well enough for most transactions, but that this system is still based on a weakness: A trust-based model. You can imagine that back in 2008, while the financial crisis was still going on, this new financial system got the eyes of a lot of financial institutions. Nakamoto introduced a new electronic payment system which was not based on trust, but on cryptographic proof. The system enabled two parties to transact directly to each other without the interfering of a third trusted party. This brings new possibilities for financial institutions. Non-reversible transactions are nowadays not really possible due to the limitation of avoidance of mediating disputes. According to Nakamoto (2008), the costs of mediation increases transactions costs, limit the minimum transaction size and cut out the possibility for small transactions.

Carlozo (2017) describes Blockchain as a digital ledger of economic transactions that is fully public, constantly updated by countless users, and considered by many impossible to corrupt. It is a list of continuous records in Blocks.

This statement is in our opinion somewhat short and Lachance (2016), gives a broader representation of the phenomena. He tells us that we have to imagine a global, online network of ledgers, which is listing every single transaction in the world. All these different transactions are verified immediately by all the users of the system. This ensures that people's privacy is protected, but that the system is transparent enough to allow oversight for everyone. Not one group in the system regulates it, which results in a neutral and accessible system for everyone.

The founder of the Institute for Blockchain studies, Swan (2015: 7), describes Blockchain as 'We should think about the Blockchain as another class of thing like the Internet a comprehensive information technology with tiered technical levels and multiple classes of applications for any form of asset registry, inventory, and exchange, including every area of finance, economics, and money; hard assets (physical property, homes, cars); and intangible assets (votes, ideas, reputation, intention, health data, information, etc.). But the Blockchain concept is even more; it is a new organizing paradigm for the discovery, valuation, and transfer of all quanta (discrete units) of anything, and potentially for the coordination of all human activity at a much larger scale than has been possible before.'

Besides the description of the phenomena, Swan (2015), also tells us something about how the technology works. She is telling that 'the Blockchain is like another application layer which runs on the existing stack of Internet protocols, adding an entirely new tier to the Internet to enable economic transactions, both immediate digital currency payments and longer-term, more complicated financial contracts' (Swan 2015: 10). Moreover, any currency, contract, hard or soft asset may be transacted with a system like Blockchain. Not only transactions can be used for Blockchain. It can also be used for a registry and inventory system for the recording, tracking, monitoring, and transacting of assets. Thus, the Blockchain can be used for any form of asset registry, inventory, and exchange, including every area of finance, economics, and money; hard assets (physical property); and intangible assets (votes, ideas, reputation, intention, health data, etc.).

3. Opportunities

To get a better understanding of the problem analysis, the link with Blockchain and the commercial real estate sector has to be made. The earlier chapter describes the opportunities of Blockchain itself, but how do these opportunities relate to the commercial real estate sector? Credit Suisse (2018), mentioned that the Blockchain technology continuous evolves in the real estate sector and they believe that the areas of development will be (1) property ownership, (2) increased transparency and (3) and the rising use of smart contracts. These areas of development are based on a survey of Coindesk, whereby involved parties mention the main benefits of the implementation of Blockchain. They mention that the ability to reduce costs, remove information asymmetry, and increase operational efficiency give Blockchain its potential to success. Credit Suisse (2018) show the main benefits and expectations of Blockchain technology. As reduce operational costs, reduce risks and shorten settlement time can be seen as the main benefits of Blockchain technology. The impact of Blockchain according to this survey will be in finance, identity, and property title. Deloitte (2017), is telling that due to the greater demand for transparency, technology advancements, and the disintermediation by startups in the commercial real estate industry, property related information is getting more and more available. The problem here is that digitized information is hosted on disparate systems which results in a lack of transparency and efficiency. In today's hyperconnected and digitized world the induct of Blockchain could have a positive effect on these factors. Another example, mentioned by Hollingshead in an article of JLL (2017) is a survey conducted by the Economist

Intelligence Unit, which asked executives across the globe what technology trends would have the biggest impact on business by 2020, 10% of the respondents mentioned Blockchain.

4. Scientific & Practical Relevance

By forming the different research questions, one question remains. Does this research has any scientific relevance and does this research contribute to the Facility Real Estate Management (FREM)-field? As mentioned earlier, a lot of articles, books, and papers have been published about the concept of Blockchain. The majority of these sources are focusing on explaining the technological phenomena and gives us an idea of what the possibilities are for different industries. Morabito (2017): 'the phenomenon has been not yet fully investigated from a strategic and organizational perspective by both academic and practitioners. Actually, apart from the volume by Tapscott and Tapscott (2016), most of the published monographic contributions concern technical, computational, and engineering phases of Blockchain. The impact of Blockchain on the buying process of real estate has not been researched. Besides the existing research is not based on the process level of buying commercial real estate. As mentioned earlier existing research on Blockchain is mostly limited to the explanation of the phenomena of the technological trend and is not focused on the strategic use for companies. This study is focused on the strategic use of Blockchain for the stakeholders which therefore will contribute to the FREM-field. Because Blockchain has the ability to reform this entire process, and could by this have a major effect on the involved parties we could conclude that this research will contribute to the FREM-field and has scientific relevance.

It is clear, with the earlier given information in mind, that more companies are researching the possibilities of Blockchain. With a technique like Blockchain, which has the ability to reshape processes and could realize an entirely new way of working, it seems obvious that this topic is worth researching. If Blockchain really has the ability to change the buying process of commercial real estate the effect on stakeholders will be enormous. The implementation will affect all parties involved, and how it will affect the stakeholders is worth researching. To fully understand the effect, the potential and implications need to be described. This research contributes to creating this understanding, in order to define a starting point for companies active in the field of real estate.

5. Literature Review

5.1 Blockchain

This chapter of the literature review will focus on the concept of Blockchain and how the technology works. Within this chapter, an analysis of the current applications is provided and linked to the real estate market. In other words, the current use of Blockchain in the real estate market is analyzed. After the description of the characteristics of Blockchain, the opportunities and limitations of this trend are listed. This list will provide an overview of the possibilities/limitations of Blockchain in the real estate sector.

Multiple sources give a clear definition of the technological trend Blockchain. According to Froystad and Holm (2015), Blockchain is a globally distributed ledger, which facilitates the movement of assets across the world in seconds, with only a minimal transaction fee. These assets can be any type of value, as long as they can be represented digitally. Crosby, Pattamayak, Verma & Kalyanaraman (2016) describe Blockchain as follows: 'A Blockchain is essentially a distributed database of records or public ledger of all transactions or digital events that have been executed and shared among participating parties''. Simply said, Blockchain can be seen as a global distributed ledger, which can facilitate the movement of assets across the world. This, against a minimal transaction fee and within seconds. This digital peer-to-peer platform allows transactions between two parties without the interference of a central institution. Satoshi Nakamoto (2008), the inventor of Blockchain, proposes with the introduction of Blockchain a solution to the double-spending problem using a peer-to-peer network: 'The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work'. This applies not only to transactions but to all types of agreements where value can be indicated.

5.1 Blockchain in the Real Estate Sector

As mentioned in the introduction, the real estate sector is known for its non-transparent characteristics. These characteristics have of course their purpose in business. In this case, it is mainly due to the competitive advantage non-transparency create for organizations. Due to the greater demand for transparency and the technological advancements, information related to a property becomes more available. Digitized and paper form information is stored and hosted on disparate systems, which results in a lack of efficiency and inaccuracy in the buying process of commercial real estate. This eventually creates a higher potential for fraudulent activities. According to Deloitte (2017), and Lifthrasir (2016), Blockchain has the potential to address these inefficiencies and inaccuracy in the

real estate sector. They are mentioning that Blockchain can result in a more transparent buying process, remove the risk of fraudulent activities and has the possibility to speed up the entire process of buying properties.

Another example of the use of Blockchain in the buying process of commercial real estate focusses on the inefficiencies of the due diligence activities. In commercial real estate transactions, usually significant time is spent on the due diligence activities related to the financial and legal review. According to the same article of Deloitte (2016), this is predominantly due to the using of physical documents for proof of identity. These documents are often stored in siloed places and have limited flexibility to be customized to suit various needs. The overall inefficient manual verification process increases administrative tasks and results in loss of information and errors. Different companies such as Telia, Chromeway and Kairos Future are trying to create a digitalize property identity system.

6. Buying Process of Commercial Real Estate

According to the Business dictionary (2017), a buying process/transaction process is 'The set of procedures used to identify products for purchase, verify quality and compliance of products and vendors, carry out purchasing transactions, and verify that operations associated with purchasing have been executed appropriately. Different organizations have buying processes of varying complexity, depending on the industry in which they work and the nature of the products being purchased'.

Devaney & Scofield (2015) used McNamara to identify the buying process for the real estate sector. McNamara (1998) explored the acquisition and sale process for UK commercial real estate through a survey of investment principals and agents directly involved in transacting commercial real estate on behalf of institutional investors. He noted three key points in the transaction process – heads of terms/price agreement, exchange, and completion – and used these to define three stages in that process: either search (buyer) or marketing (seller), due diligence and settlement. However, a typical transaction as identified by the case study interviewees includes a pre-marketing process. Therefore, transaction time commencing with the marketing of the particular asset underestimates the total time for the sale process.

The pre-marketing period consists out of three stages whereby four decisions have to be made. The step is the decision to sell a property as an asset. This could be seen as a portfolio decision and this process is similar for all competing assets. This all triggers the sale process. This stage runs from this decision and the decision as to which sector the particular asset to be sold will come. Next is the decision to sell a particular property within the chosen sector. Finally, when the decision is made, the property will be made ready for the market. This particular phase is characterized by a long duration according to McNamara (1998).

When arriving at the third stage, thus between the decision to sell and the marketing stage, an instruction to agents is given. Here the agents prepare and make an assessment of value and marketability. Solicitors are often instructed to identify and asses potential legal obstacles for sale. The duration of this phase is normally one or two weeks. Agents and solicitors have the responsibility to identify market factors and asset-specific factors which need to be addressed before the marketing phase.

According to the study interviews provided by McNamara (1998), and with a duration of three to four weeks, the formal marketing occurs. This phase involves the production and distribution of brochures and other advertising techniques. The intention is to invite the Best Bids from interested purchasers.

Bosak, Mayer & Vogel (2007) are more focused on the transaction costs inefficiencies of the process. They are telling in their book, that the chapters of a due diligence/transaction process consist of real estate issues, legal issues, tax and accounting issues, and technical issues. These issues result in high transaction costs. They are saying: That the costs for a professional due diligence investment could get into the hundreds of thousands of euros. Although different sources define different problems, all sources indicate that the main inefficiencies occur in the due diligence stage.

Eventually, the exchange of contracts takes place. When this part is completed the sale becomes certain. For properties sold at auction, price agreement and exchange of contract occur as McNamara (1998) says: 'when the hammer falls'.

The final part of the buying process is characterized by legal completion. This is the date on which ownership rights are transferred to the purchaser and cash is transferred to the vendor. Although the simultaneous exchange of contract and completion has become more common nowadays, the norm, and duration to reach the stage of completion is two to four weeks.

Crosby and McAllister (2004:9) provide further evidence for UK commercial real estate buying process. They focused on the sell side of the transaction and measured average times per stage of the sale process using data on

187 transactions collected from the records of three major real estate investors for the periods 1995-1996 and 2000-2002. The authors adapted McNamara's stages of the sale process, expanding these to six: the decision to sell sector, decision to sell an asset, pre-marketing, marketing, due diligence and exchange to completion.

Hordijk and Teuben (2008:9) provide evidence on transaction times for the Netherlands, also focusing on sellers. They conducted interviews with brokerage firms and gathered evidence on 512 real estate transactions occurring between 1995 and 2002. They did not conduct any econometric analysis despite their relatively large sample. Instead, they tabled average times by sector, year of sale and value of the sale concerned. They also discuss the opportunity costs arising from delays in real estate transacting.

According to the different sources, we can conclude that the transaction process includes 4 different stages, whereby the first two are included in the pre-marketing stage. So, the different stages are decision to sell sector, the decision to sell an asset, pre-marketing, marketing, due diligence and exchange to completion (Crosby & McAllister, 2004). In these stages, the most obstacles were presented in the due diligence phase.

7. Research Methodology

The objective of this research is to determine which stage of the buying process of commercial real estate, the technological trend Blockchain, can add value for the stakeholders involved. The first objective is the formulation of the different stakeholders involved in the buying process. What are their characteristics? What are their goals and motives in the process, and how do they add value to the process? To do so, the buying process itself has to be defined. By the definition of the buying process, with its different stages, stakeholders can be classified in these stages. When the classification is provided, the characteristics of Blockchain can be described. These different characteristics, which will be influencing the stakeholders and the buying process, will be formulated and questioned to stakeholders who should give insight in the factor ''added value'' of Blockchain. The factor or so-called definition of added value should be defined for each stakeholder to eventually answer the main research question. In this case, the ultimate objective in the process, for the different stakeholders, will be linked to the theory of the term added value to define a value for the stakeholders. Furthermore, this research is being conducted in order to discover the motives and reasons for the stakeholders to implement (or not) the technological trend.

7.1 Field Research

The field research in this study is focused on semi-structured interviews with stakeholders involved in the process and experts of Blockchain. In the expert panel (appendix 3) the criteria for the researchers choice has been described.

The first phase of the conducted interviews was focused on experts of Blockchain technology. These experts provided insight into the possibilities and constraints of the technology. They also provide information to shape the research questions and made a focus for my problem statement. Eventually, these experts were the base of answering the first sub-question, which is focused on the characteristics of Blockchain.

The interviews were of an unstructured nature because they need to provide a wide base of information and data input. I also asked the interviewees were they think Blockchain add value to the process, to see if there is a misalignment between the theoretical and practical use of the technology. The interviewees are one of the first users of Blockchain and meet the following criteria:

- Academic background in line with subjects of the research.
- Current function in the field in line with subjects of the research.
- Work experience in line with subjects of the research.
- The current organization of work in line with subjects of the research.
- Knowledge and involvement in different subjects of the research.

The second phase of the interviews was conducting interviews with experts in the buying process. Experts are seen as persons who have working experience in the different phases of the process. These stakeholders are involved in the entire process, and could, therefore, provide information on all different stages of the process. In this case asset managers, commercial advisors, notaries, and legal/fiscal professionals were interviewed. These groups could provide the most valuable information because they know specific information about all different stages. Therefore they were the base for answering sub-questions two and three. These interviewees also meet the criteria mentioned earlier.

Because the focus lays on commercial real estate I interviewed experts who are working at large real estate corporations. These corporations are JLL, and Cushman & Wakefield. Four different interviews were conducted

to give insight into the overall buying process. To add an extra dimension into the research a particular group in a particular stage is added in the research. This part should provide insight into the advisory group of the stakeholders. This group is closely involved in the end parts of the process and could, therefore, give extra insight into these particular parts. Two civil law notaries are therefore interviewed to provide this information.

The aim or goal of the interviews can be split in two. First, the goal of the interviews is to make an identification of the constraints and possibilities in the current buying process. This to identify the possibilities of Blockchain (focused on its characteristics possibilities). The second part is the aim of revealing the demands and usability of Blockchain in the process for the different stakeholders. This to eventually provide information on which stage is most suitable for the implementation of Blockchain.

The interviews will provide qualitative data which will be further analyzed. All the interviews will be transcribed and coded to make sure that this data can be used for further analysis. The finding of the interviews will be combined with the results of the literature to answer the main research question.

7.2 Semi-Structured Interviews

As mentioned earlier the semi-structured interviews need to be analyzed to give proper recommendations. According to Saunders et al (2009) to be useful, the data needs to be analyzed and the meanings understood. Qualitative data analysis procedures assist this, allowing you to develop theory from your data. They include both deductive and inductive approaches and, like the process you use to construct a jigsaw, range from the simple categorization of responses to processes for identifying relationships between categories. The method of data collection in this research can be identified as deductive. This means that themes, indicators, and qualifications, related to the subject, and which were derived from the literature review, were summarized into a simplified overview (open coding). The topics, granted out of the literature study, in this overview are related to each other and by this, a structure can be formed (axial coding), also called a code tree.

The literature review formed the base of the eventually formed codebook. This all was performed before the actual interviews were held. Each topic of interest, in my case based on the sub-questions, were given a code. These codes seem to be important to analyze after the conducted interviews and data collection which derived from these interviews. These codes could vary from very specific codes, such as the characteristics of Blockchain, to a more holistic code, for example, the challenges of implementation of Blockchain.

When the interviews were conducted and open coded, new information or data was added to the code system. An example of this code system is given in Appendix 4 (Nijland 2018). The example of the coding process is illustrated in Appendix 5 (Nijland 2018). The example of the coding process of the transcripts can be found in Appendix 6 (Nijland 2018), and the summary grid of all the results can be found in Appendix 7 (Nijland 2018. With the help of the coding program MAXQDA the interviews were coded. This happened due to the new insights interviewees gave to this research. These new codes were added to the existing code tree and allowed the author to analyze on a very specific and thorough level. In order to classify the main codes, a categorization has been made. This categorization divided main codes into sub-codes and these in sub-sub codes. The main code existed therefore out of multiple sub-codes. By axial coding, the link between the codes has been defined and also given by this an in-depth-character to the final codebook. This all resulted in a higher quality insurance of the data collection.

In consultation with the interviewees, the transcript is adjusted to ensure that the conversations are not taken out of context. The transcripts self can be found in the Appendix 9 (Nijland 2018). An expert panel overview is also added to the Appendix to give an identification of the interviewees. The relation to the topic and their work experience can be found in Appendix 3 (Nijland 2018).

8. Research Question(s)

The central research question (RQ) is defined as ‘n which stage of the buying process of commercial real estate can Blockchain provide added value for the stakeholders involved? Deriving from the central research question are the following sub-questions (S):

SQ1: What are the characteristics of Blockchain and to what extent is it applied in the current situation?

- What is Blockchain technology and how does it work?
- What are the opportunities and threats of the implementation of Blockchain for the buying process of commercial real estate?
- How is Blockchain currently applied in the buying process of commercial real estate?
- What are the challenges of implementing Blockchain in this buying process?

Which should be mentioned here is that SQ1 is a chapter which should contribute to the knowledge of the trend itself. One should know how something works when suggesting what its possibilities and limitations are. Especially in this case concerning multiple stakeholders/groups. Some characteristics seem to be more important for a particular stakeholder than another. The usability and added value of the trend could be therefore proved by history. Meaning that the explanation of current user cases could help identify the added value of Blockchain which indirect could result in answering the main research question. The identification of implementation challenges are important, to conclude if an implementation is worth the try for stakeholders.

Because the stakeholders will be linked and identified into the different phases in the buying process there is chosen to combine the characteristics of the stakeholders and the buying process in one sub-question.

The breakdown structure of the research can be seen below.

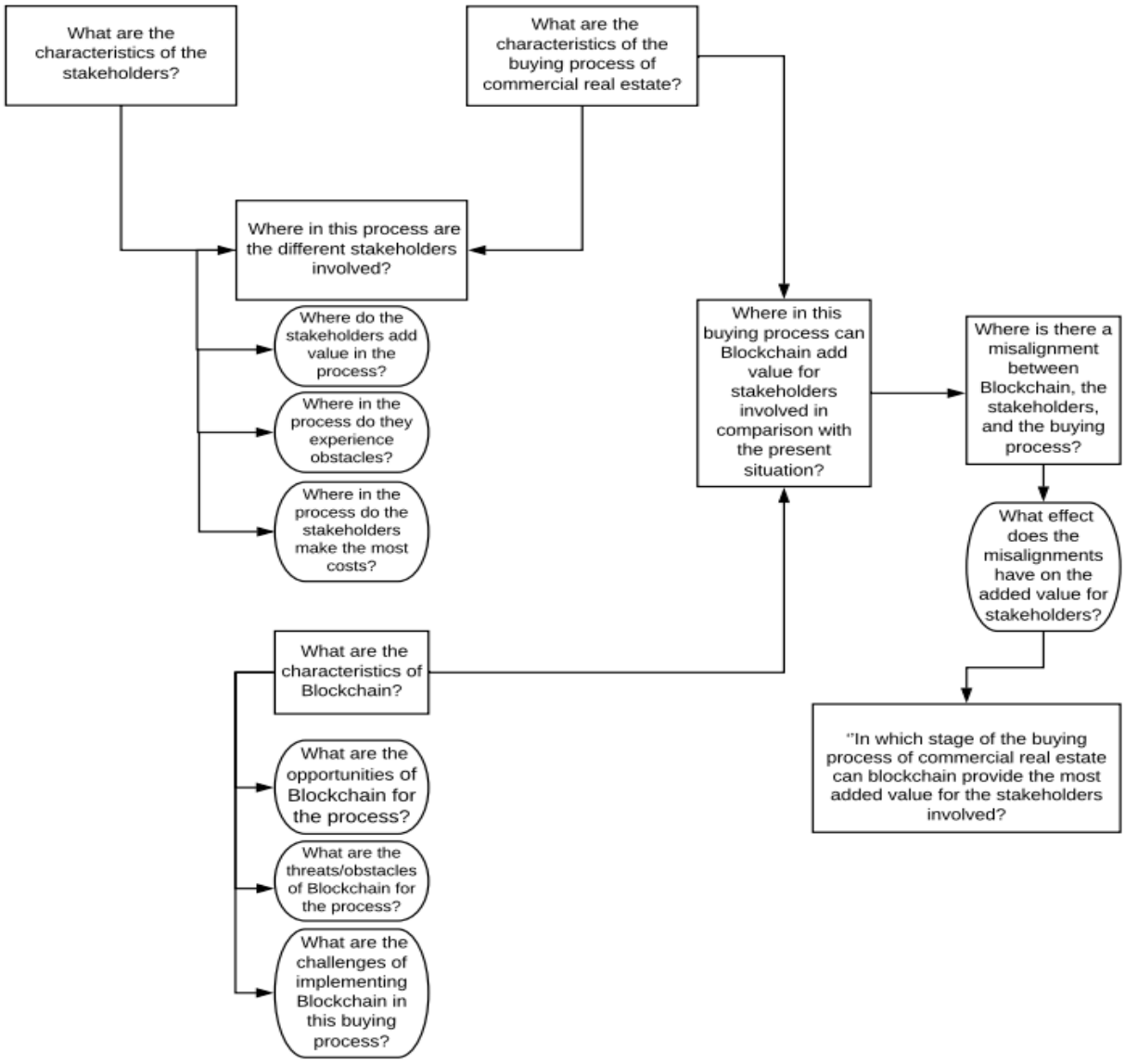

Figure 1. Schematic representation of (sub) questions (source Nijland 2018)

SQ2: What are the characteristics of the stakeholders and the buying process of commercial real estate?

- What are the characteristics of the different phases of the buying process?
- What are the characteristics of the different stakeholders?
- Where in this process experience the different stakeholders obstacles/problems?
- Where in the process are made the most costs by the different stakeholders?

- Where in this buying process can Blockchain add value for stakeholders involved in comparison with the present situation?

SQ3: Where is there a misalignment between Blockchain, the stakeholders, and the buying process?

- Where is there a misalignment between Blockchain implementation and the Stakeholders?
- Where in the buying process is there a misalignment between the Stakeholders and the buying process?
- Where is there a misalignment between the Blockchain implementation and the buying process of commercial real estate?
- What effect do the misalignments have on the added value for stakeholders?

9. Research Strategy

In order to complete this research, various methods will be used to gain the necessary information and data. In total there will be two different methodologies used to collect data, which are; 1) a literature research, 2) semi-structured interviews. Chosen is for these types of collecting data to create triangulation. Triangulation refers to the use of multiple methods or data sources in qualitative research to develop a comprehensive understanding of a phenomenon (Patton, 2002). Triangulation also has been viewed as a qualitative research strategy to test validity through the convergence of information from different sources. Denzin (1978) and Patton (2002) identified four types of triangulation: (a) method triangulation, (b) investigator triangulation, (c) theory triangulation, and (d) data source triangulation. In this case, methodological triangulation has been used. According to Kennedy (2009), methodological triangulation involves using more than one option to gather data.

Data source triangulation would also be achieved in this research. In any transaction process, there is a buyer and a seller, which result in different perspectives. Because the interviewees work close and are the speakers of both parties, both perspective will be taken into consideration formulating the added value of a Blockchain. These different data sources will, therefore, result in data source triangulation.

9.1 Desk Research

Before you start with a proper research, a knowledge foundation of the research object has to be established. In this research, this has been accomplished by a literature review. This review provides us with an understanding of the theoretical background, theories, and concepts of the discussed topics. A well-performed literature review provides a foundation for the research and brings focus to the particular research problem. Kumar (2011), tells us that a well-executed review brings clarity, focus, and improvement of the research methodology. It also broadens to the knowledge base which is necessary to conduct a research. Because this topic is particularly new in the field of real estate, not much information is provided. With this in mind, the literature which is available function as an important pillar for this study. The main aspects which will be clarified by the literature study are the characteristics of Blockchain, the stakeholders involved in the process, and the buying process of commercial real estate. Besides these three pillars, types of added value also will be described in the literature part of this study. Below a description of the main pillars of the literature study.

Blockchain:

Because Blockchain is a very technical phenomenon our focus will lay on the exploration of the possibilities for the real estate sector. The technical part will be shortly described by introducing the concept of Blockchain. Because the technical part is not really interesting for the different stakeholders, the focus will not be on the technical aspects of the technology. The concept of Blockchain will be described to understand the technology and be used to be able to understand the possibilities and restraints of the technology for the stakeholders.

Buying Process of Commercial Real Estate:

The buying process needs to be limited to a specific field to identify its limitations and possibilities. Therefore we've chosen to limit it by the way of choice for the commercial real estate sector. This literature provides us with a framework with different stages. These stages have their own characteristics and involved stakeholders which have their own added value and limitations in these stages. The idea is that the buying process will be divided into different stages to provide eventually a focus for implementation of Blockchain in a certain stage.

Stakeholders:

Because the buying process has a lot of different stakeholders, we've have chosen to identify the players who are the closest involved in this process. Based on literature we've made an overview with the different players in the field. Besides this overview, the objectives of these players are identified, to eventually link the added value drivers of Blockchain to the objectives of the stakeholders. The choice of the stakeholders is also based on the

characteristics of Blockchain. Certain players in the field will be more affected by the implementation and therefore have a bigger influence on the entire process. Because of this they will be included or excluded from the research.

9.2 Field Research

The field research in this study is focused on semi-structured interviews with stakeholders involved in the process and experts of Blockchain. In the expert panel (Nijland 2018) the criteria for the researchers choice has been described.

The first phase of the conducted interviews was focused on experts of Blockchain technology. These experts provided insight into the possibilities and constraints of the technology. They also provide information to shape the research questions and made a focus for our problem statement. Eventually, these experts were the base of answering the first sub-question, which is focused on the characteristics of Blockchain.

The interviews were of an unstructured nature because they need to provide a wide base of information and data input. We've also asked the interviewees were they think Blockchain add value to the process, to see if there is a misalignment between the theoretical and practical use of the technology. The interviewees are one of the first users of Blockchain and meet the following criteria:

- Academic background in line with subjects of the research.
- Current function in the field in line with subjects of the research.
- Work experience in line with subjects of the research.
- The current organization of work in line with subjects of the research.
- Knowledge and involvement in different subjects of the research.

The second phase of the interviews was conducting interviews with experts in the buying process. Experts are seen as persons who have working experience in the different phases of the process. These stakeholders are involved in the entire process, and could, therefore, provide information on all different stages of the process. In this case asset managers, commercial advisors, notaries, and legal/fiscal professionals were interviewed. These groups could provide the most valuable information because they know specific information about all different stages. Therefore they were the base for answering sub-questions two and three. These interviewees also meet the criteria mentioned earlier.

Because the focus lays on commercial real estate we've interviewed experts who are working at large real estate corporations. These corporations are JLL, and Cushman & Wakefield. Four different interviews were conducted to give insight into the overall buying process. To add an extra dimension into the research a particular group in a particular stage is added in the research. This part should provide insight into the advisory group of the stakeholders. This group is closely involved in the end parts of the process and could, therefore, give extra insight into these particular parts. Two civil law notaries are therefore interviewed to provide this information.

The aim or goal of the interviews can be split in two. First, the goal of the interviews is to make an identification of the constraints and possibilities in the current buying process. This to identify the possibilities of Blockchain (focused on its characteristics possibilities). The second part is the aim of revealing the demands and usability of Blockchain in the process for the different stakeholders. This to eventually provide information on which stage is most suitable for the implementation of Blockchain.

The interviews will provide qualitative data which will be further analyzed. All the interviews will be transcribed and coded to make sure that this data can be used for further analysis. The finding of the interviews will be combined with the results of the literature to answer the main research question.

10. Results

SQ1: What are the characteristics of Blockchain and to what extent is it applied in the current situation?

SQ1.1 What is Blockchain Technology and how does it Work?

The technological aspect of Blockchain has not been questioned by the interviewees. Therefore no relevant information is added to this question in regard to the technical aspects of Blockchain. This question will, therefore, be answered with the focus on the negative and positive aspects of Blockchain to eventually identify the characteristics of Blockchain.

The positive aspect described by the different sources (Ray, 2015; Swan, 2015; ABN AMRO, 2016; Barrington, 2016; Bhargava, 2016; Deloitte, 2016; Donkers & Santing, 2016; Kaplan, 2016; Lifthrasir, 2016; Tapscott &

Tapscott, 2016; Cushman & Wakefield, 2017; Hoefsmit, 2017) give a clear definition of the positive aspects of Blockchain. The main positive aspects of Blockchain mentioned by these sources are:

Positive aspects literature:	**Positive aspects interview data:**
Digital records of real estate assets	Data storage security
Re-design of real estate processes	Reliability increase stakeholders
Transparent markets	Decentralized character Blockchain
Payment system	Transparent Markets
Smart contracts	Accessibility

Although the interviewees mention transparency of the market and safety as positive aspects of the Blockchain, different main positive aspects were mentioned. For example, the decentralized character of the technology. Three interviewees mention that the main positive aspect is the elimination of the so-called third thrust party. Daan mentioned: ‘’Blockchain can ensure that transactions take place directly between two persons automatically and securely without the need for a third party to validate the authenticity of the transaction’’.

The other main positive aspects were data storage security, accessibility for stakeholders, and the reliability increase. Although safety aspects were mentioned by the different sources in the literature review, it was not the main positive aspect of Blockchain. The interviewees were all focused, as can be seen from these results, on the positive aspect of the security of the Blockchain.

With the same sources in mind, as mentioned above, different negative aspects were mentioned about Blockchain technology.

Negative aspects literature:	**Negative aspects interview data:**
The early stage of development	The early stage of development
Different applications for different purposes	Untruth in input Blockchain
Integration in existing business models	Security issues
Security vs. cost and efficiency vs. costs	Third thrust parties
Government regulations	Different applications for different purposes

As can be seen from the results of the interviews the negative aspects do mainly accord with the negative aspects of the literature review. The early stage of development is the main negative aspect of the technology according to the interviewees.

Also the aspect of garbage in garbage out was several times mentioned by the interviewees. The technology does not control the verity of documents but only controls the quantity of document which is put into the Blockchain. The input in the Blockchain could, therefore, be false and could impact the reliability factor for the stakeholders.

Although aspects as security issues and the removal of third thrusted parties have been mentioned as positive aspects of the Blockchain they also have been mentioned as negative aspects of the Blockchain. Due to the specialized nature of work of multiple stakeholders, the distinguishing of these stakeholders seems to be no option. An example here is that particular knowledge is needed in the buying process to verify an acquisition. The notary in this example has the authority to verify and complete the transaction. This stakeholder seems to be necessary for the process even with implementing a Blockchain. The conception of the total removal of third thrust parties is therefore false. In the state Blockchain occurs now, it is not possible to remove particular advisors such as a notary. The function of a stakeholder could change, but the total removal of advisors is excluded.

SQ1.2 What are the opportunities and threats of the implementation of Blockchain for the buying process of commercial real estate?

The negative aspects of the Blockchain certainly have an influence on the threats of the implementation of Blockchain in the buying process. When we take a look at the different threats, most participants, in total five, think that creating support for the technological application within an organization is a major obstacle. The way of working should be adjusted and adapted to make Blockchain a success. Interviewee X – in this article we called each interviewee X; the names are known by the authors - for example, is telling ‘I tend to carry out certain processes in the way that we always did. There is therefore still too little support to really make use of this technology’. Interviewee X agrees with this statement, but only focusing his answer on certain stakeholders. He is telling ‘many processes certainly have not changed at banks and notaries, because they always have confidence in the current system’. Interviewee X is focusing more on the obstacle of convincing people within the organization

of seeing the benefit of a Blockchain. He is telling ‘We see that a lot of parties are involved and busy with Blockchain, but taking the step to adjust the entire process is too big of an obstacle for many parties.’

Besides the support threat, we see more threats mentioned by the different stakeholders. three of them mention the threat of costs. Interviewee X, for example, is mentioning that the cost for an implementation is certainly a challenge. ‘’Blockchain is in fact very expensive to develop. 20,000 euros for development can be just too much for many companies. Cost is certainly a major obstacle for something that is not fully developed’’. The negative aspect of Blockchain ‘’ Security vs. Cost and Efficiency vs. Costs’’ mentioned by the literature, therefore, can be seen as a threat to the implementation.

The early stage of the technology seems to be as well an obstacle for the interviewees. Two of them mentioning that the technology is not quite ready for safe and secure implementation. Interviewee X and Interviewee X both agree on this statement. Interviewee X does not really agrees with the statements of the earlier mentioned stakeholders but mentioning the costs of changing the entire process. Moving away from your current process takes time and money and sees this as the major obstacle for the implementation of Blockchain. The negative aspect ‘’early stage of development’, with this example given, can be seen as a threat for implementation of the technology.

Another obstacle worth mentioning is that people not really understand what a Blockchain exactly does. The complexity of the new technology creates confusion on how Blockchain really works. Interviewee X is telling ‘here is also often a misconception about Blockchain. Blockchain does not ensure that incorrect information is put in right into the system, but ensures that the available information is distributed in a secure, safe and digital way. Interviewee has made a name for this phenomenon: “Garbage in garbage out”. He is telling that Blockchain is nothing else than an application which delivers transparency in the documents which are delivered by the different stakeholders. The misconception of the usability of the technology seems by the interviewees an obstacle which has to be overcome to let the implementation of Blockchain a success.

The final obstacle which has been mentioned by the interviewees is the obstacle of legislation and lawmaking. Interviewee X is questioning of Blockchain is capable of implementing legal preconditions. He does not think that Blockchain complies with the legislation of AVG (Algemene verordening gegevensbescherming) and WFT (Wet op het financieel toezicht). Interviewee X also mentions his concerns about the legislation. He tells us: the AVG has a big influence on Blockchain and ensures a long duration. It also makes it difficult for the Blockchain to make big strides. Besides the practical problems for stakeholders the law conditions also have a negative side effect on the implementation of Blockchain. The negative aspect ’government regulations has been confirmed by the interviewees as a threat for the implementation.

The opportunities for implementing Blockchain are given in the form of the positive aspects of Blockchain. The interviewees especially see opportunities in the phases were data needs to be structured, controlled and safely secured. The literature is clear about the possibilities of creating digital records of real estate assets and the re-design of processes. The answers of the interviewees agree with these positive aspects of Blockchain presented in the literature. The phases pre-marketing and due diligence seem to be the phases which are most suitable for the implementation of Blockchain. Interviewee X mentioning: Blockchain is most suitable in the phase where data storage and recording must be maintained. This must be done so that it is easy to prepare for sale. Therefore, for the pre-marketing phase, I still see opportunities for improvement’’.

SQ1.3 How is Blockchain currently applied in the buying process of commercial real estate?

Blockchain is already applied in buying process of commercial real estate. Al interviewees could give examples of Blockchain possibilities applied in the buying process of commercial real estate. Interviewee X and Interviewee Xboth mention the start-up Annexum. Jan is telling: ‘’The owners of Annexum devised a program that is self-learning. The idea behind this is that if, for example, you want to have a supermarket somewhere in the Netherlands, you can see exactly, with the help of a google maps card, where this can be most advantageous by means of costs. The program can indicate the exact rent of one square meter on the map. We received a demo from that owner and he asked us to enter an address of our stores in the system. As it turned out, we were shown the exact rental price of our buildings. So if you continue to refine this program and put a Blockchain under it, whereby every rent has to be approved, you are no longer dependent on appraisers and brokers. The price of an object is known by the computer’’.

Other practical implementations of Blockchain mentioned by the interviewees are:

- Blockhaus, which do property rights who run through a Blockchain.

- Blandlord, which is meant for a house that is owned by several people. Interviewee X is telling: 'Because of the Blockchain, owners only have to go to a notary at the start, but not with every change if, for example, one of the owners decides to leave. This, of course, ensures a much more efficient process'.
- Propy, which is a smart contract for buildings.
- Deloitte, which is busy with digitalizing rent information based on a Blockchain.

SQ1.4 What are the challenges of implementing Blockchain in this buying process?

The challenges of implementing Blockchain in the buying process were mainly technical and based on an overestimation of the technology. Interviewee X's main challenge for implementing Blockchain was an overestimation of the technology. Besides this he mentioned: ''Blockchain only takes over the piece of administration. More innovations and technologies will be needed to really make it work''. Interviewee X also mentioned these IT obstacles. He mentioned that Blockchain is a low-level development and that it only works when different databases of the institutions will be linked to each other. When this is not realized the Blockchain never will be implemented. Another concern is that organizations and stakeholders do not want to concern themselves with these technological aspects. Interviewee X mentioned: 'I think that a lot of organizations/stakeholders do not want to concern themselves with this. It just has to work and if a Blockchain is used for it, that will be their concern'. Besides the concerns, Interviewee X also has doubts if the involved parties have the competences/ skills for the implementation. He expects that larger parties will have to take the lead in this process to make Blockchain implementation work. Intervieuwee expects that the complexity of the technology will be a challenge for the implementation of Blockchain. He mentioned: ''The technology behind Blockchain is pretty complex. For our profession, but also for lawyers in general, one and another is difficult to understand. If we want to benefit from the possibilities that Blockchain technology offers us, we also need to become familiar with relevant terms such as nodes, keys, public and private networks and smart contracts. Finding out all legal aspects seems like a big challenge to me''.

Interviewee X and Interviewee X are especially worried about the duration of implementation of Blockchain. They are telling that the implementation of a new technology takes time and that a new technology never works the first time you will test it. Interviewee can find himself in this statement telling that the main challenge for implementing is on the IT side. Especially because this technology is not fully programmed. The time and money which have to be invested to make it operational seems to be major challenges.

SQ2: What are the characteristics of the stakeholders and the buying process of commercial real estate?

SQ2.1 What are the characteristics of the different phases in the buying process?

The characteristics of the different phases in the buying process are identified by literature. No information has been provided by interviews data. See table 2 for method of data collection. Further explanation about this chapter can be found in the literature review.

SQ2.2 What are the characteristics of the different stakeholders?

The characteristics of the different stakeholders are identified by literature. No information has been provided by interview data.

SQ2.3 Where in this process experience the different stakeholders obstacles/problems?

Looking at the data results from the interviews, two different phases has been recognized as phases with obstacles/problems. The first and most mentioned is the due diligence phase. Interviewee X mentioned in his interview:'' I don't see Blockchain as a decision-making program. The biggest opportunity for Blockchain is in keeping document and made agreements secure. Without a Blockchain, we experience that we lose documents which have a negative effect on the process. These phases are therefore most difficult to run through''. Interviewee X agrees with Interviewee X, telling: ''I think the due diligence phase is most difficult to run through. This is because both parties and legislators set strict requirements for a particular transaction/transfer. An agreement can still be somewhat form-free to close, making it more susceptible to Blockchain. This, in contrast to actually transferring the real estate, where previously set legal requirements have to be met and most of the work has already been done''. Another worth mentioning obstacle in the process is told by Interviewee X. He is mentioning that the different stakeholders use different taxonoour, which makes the process inefficient. There are for example five different words for ''Kadaster'', which leads to confusion and inefficiency with the request of information by advisors. Also, standardisation and automation are made difficult by the difference in taxonoour.

Interviewee X and Interviewee X both agree on the most difficult phase. They think the pre-marketing phase is the most difficult to run through. This because this phase has a big effect on the phases afterwards, meaning that if

problems occur it would be in this phase. This because pre-work has to be done correctly to let the process run smoothly. Interviewee X, for example, is saying:'' Yes I really think the pre-marketing process is most difficult to run through and this is particularly because this phase has a big influence on the follow-up trajectory. If this phase is properly completed, you are actually already far. Having documentation in order is a plus because it makes the follow-up process easier''.

With the obstacles presented in the literature review by McNamara (1998) and the results of the interviews, we see that changes in the preserved data and documentation leads to the major obstacles in the process. By data meaning, changes in asset e.g. tenant default information, changes in market conditions and changes in the circumstances of the purchaser. These obstacles are mostly formed by the incomplete deliverance of data of the sold object. The pre-marketing phase is strongly linked, by collecting this data for selling and is therefore also mentioned as a phase where obstacles and problems will appear.

SQ2.4 Where in the process are made the most costs by stakeholders?

To give an unambiguous answer here, the author looked at the phase at which most costs were incurred by the various parties involved in the process. What is striking from the results of the interviews is that most costs are incurred in a certain phase. This due diligence phase is indicated by everyone as the phase where most costs are incurred. The different answers also clarify why this is. It is because most parties are involved in this phase. Advisors are involved to check documents for the final transaction and technical advisers are also called in to detect defects in a building. Also, this phase takes the most time. Interviewee X mentioned in his answer: ''Takes a long time and is expensive. Can cost 1% of the transaction price''. Interviewee X gives a more detailed view of the cost made in the process he mentions:" If a transaction succeeds you pay the most to the commercial advisor. For example, if you have a 50 million building. you pay 20k for the legal, 10k for technical and 400K for commercial. And this is because the commercial advisor is present in the process from the beginning till the end. In addition, when he is not chosen to fulfill the project of a buyer of real estate he takes the most risks by not inning the transaction fee. The lawyer will come in the second place because he seals the risks for both parties. He is well paid for this''.

SQ2.5 Where in this buying process can Blockchain add value for stakeholders involved in comparison with the present situation?

Multiple changes for the adding of value for stakeholders in the process were mentioned by the interviewees. Especially the due diligence phase was mentioned as the phase in the process where value could be added by the implementation of a Blockchain. Interviewee X and Interviewee X all mentioned this phase. The reason for this phase was mainly because this phase includes the control of documents, and could therefore by the implementation of Blockchain, result in more efficiency. The improvement of efficiency would lead to declining costs, which would be beneficial for the buyer and seller of a property. Interviewee X mentioned 'If you look at the process with all its stakeholders, so the buyer and seller, notary, technical avisors, brokers etc, you see that the seller simply wants to sell its property in a secure and safe way, and does not want problems after he sells its property. The buyer just wants to buy it for financial benefit. The advisors are much more concerned with the content, so really specialized. I, therefore, expect that they can derive the most benefit from this because Blockchain could contribute to security and safety measures of this content. This eventually would lead to cost reduction for the buyer and seller'.

The added value for the advisory stakeholder is also mentioned by Interviewee X. He is telling: 'I see the opportunity for the civil-law notary to act as a gatekeeper in matters relating to identification and authorization. The technique would leave something to be desired about identity guarantees. Here again, the confidential role of the notary is good when it comes to checking the authenticity of a person's identity or the protection of someone's identity'. Interviewee X thinks that the contribution of smart contracts could be very beneficial for the advisors in the due diligence process. He is mentioning 'I think that smart contracts can make a huge contribution to the entire due diligence process. In our opinion, there are a lot of contracts which can be automated. By the automatization of the contract, the workload on various advisors will be majorly declined. For example, An escrow is attached to the SPA, this is a reservation of capital to carry out repairs, the third party that is used for this could be completely banished from the process.' Seven of the total of nine see the most possibilities of added value in the due diligence phase and four of them see a positive role for the advisors with the implementation of Blockchain.

The interview data results are clear about the phase which could benefit the most of an implementation of Blockchain. This seems to be in line with the literature. According to Deloitte (2016), significant time is spent on the due diligence activities related to the financial and legal review.

Another phase which has been mentioned frequently is the pre-marketing phase. Interviewee X mentioning: 'I also see possibilities in the phase where an object is made ready for sale. This is in the pre-marketing phase. As well, many documents have to be prepared in this phase. The more of these documents are present, the more buyers will have interest in an object''. The relationship between the pre-marketing phase and due diligence phase has been explained by Janssen, he tells us: ''The pre-marketing is done by the seller. In this stage, the seller brings all documents in order. They do this so that the buyers in the marketing phase have the same image of the selling object. So for example, in the due diligence phase, you get bidding rounds. Sometimes these bids are different and vary a lot from each other. This is because the pre-marketing phase is not well prepared. The information is therefore not complete or incomplete. Because the information is not complete, the buyers must make assumptions that ensure that the bids are different. The implementation of a Blockchain with the help of a portfolio of a building could, therefore, provide a solution. You could certainly do something here in information retrieval. The link which can be made here with the due diligence and pre-marketing phase is that in the phases of controlling content Blockchain can add the most value'. The pre-marketing phase is also mentioned by Interviewee X because he thinks that this phase is the easiest part for the implementation of Blockchain.

SQ3: Where is there a misalignment between Blockchain, the stakeholders, and the buying process?

The effects of misalignment of Blockchain on the buying process were discussed in the chapter challenges of implementing Blockchain in this buying process. Mainly IT obstacles formed the main misalignment between Blockchain and the buying process. The literature is also focused on this factor. Kumar (2018), mentioned 'Blockchain might seem to be offering similar advantages as of Bitcoin to other industries. But it needs to be re-architected for different user cases. Organizations need to closely evaluate which business operations will be closely working with Blockchain. For lasting success, it should be integrated seamlessly with other systems in an IT network. Other misalignments which have been mentioned by the interviewees can be divided in the following aspects:

The social aspect of Blockchain is mainly focused on the change in way of working. Processes need to be changed to let Blockchain be a success. This immediately will result in work scope change, meaning that involved parties need to change their working activities to be relevant in the process. The willingness to do so seems to be a challenge for the interviewees.

The economic aspect is mainly focused on the increase in costs. The implementation of Blockchain requires time and money which will result in extra costs. Because the added value of Blockchain is with most participants unknown or irrelevant, support for the implementation of Blockchain is unsure. In addition, the question must be asked who will ultimately pay for the implementation.

The legal aspects are mainly based on privacy issues. With the upcoming GDPR regulations, the question remains if Blockchain is the best technology to preserve personal data. The participants see a misalignment between the use of Blockchain and the privacy regulations of data.

The technological aspects are mainly focused on understanding the technology. Most stakeholders don't really understand the underlying technique and taxonoour, which make it difficult for them to see the possibilities. Besides this, the technology is relatively new, resulting in low confidence in the technology itself.

SQ3.1 What effect does the misalignments have on the added value for stakeholders?

The overall effect of the misalignment does have a negative effect on the added value of Blockchain for the stakeholders. All of them were clear about the effect saying that the implementation would not be accomplished when the added value of Blockchain would not be recognized due to the misalignments.

11. Discussion

In regards to the different sub-questions, and from a more holistic perspective, there seem to be some differences in the interview data results and the literature provided on this subject. For example, sub-question one, which identifies the positive and negative aspects of a Blockchain. The interview data results mainly focus on positive security and safety aspects of the Blockchain, where the literature speaks about digital records, re-design of processes, and the increase of transparency. Multiple sources are used to give a general view on the positive aspects of the trend, but this provided aspect list seems not to be in line with the reality. The heterogeneity of the respondents, with their different backgrounds, could have influenced the results which have an impact on the reliability of the research. With this in mind, it is remarkable that the negative aspects, received from the interviews, seems to be a lot more in line with the literature results. Which could indicate that there are actually differences in reality and literature. In this sub-question, the negative aspects according to the interviewees were focused on the

premature nature of the trend. The early stage of development results in security issues which affect the driver of success (positive security/safety aspect) of the trend.

The discussion about the difference in reality and the literature results do not take away the fact that the positive aspects and negative aspects of Blockchain are interrelated and also in contrast with each other. Interviewees mention security as main positive aspects, but also acknowledge the fact that the early stage of development is a threat for this ''secure system''. Blockchain is still hackable which results in the question if this system is the right system to transport data. You could also discuss the fact if a hackable system is worth the transition and re-design of your current process. Would you trust your digital records in a hackable system? Or do you want to increase your transparency with a hackable system? I don't think so. The interrelation and contrast of the different positive and negative aspects do not help with introducing an implementation of a Blockchain in this process.

For follow up research, and especially focused on this sub-question, I would recommend to choose a particular stakeholder and research the fact of these positive and negative aspects are still the same with a more homogeneous group of interviewees. By doing so, a more objective and unilateral view is created, which positively influences the results.

Looking at sub-question two, we see that the interview data results are agreeing with the statements made in the literature review. A side note which has to be made here is that the disappearance of particular stakeholders, mentioned as a positive aspect of implementation, is in contrast with the given information in the interviews. Here, the interviewees mention that the distinguishing of particular parties is not an option due to their specific knowledge of the process. The commonly named advantage of the disappearance of third trusted parties is therefore in contrast with the author's findings. Because this statement is in sharp contrast with the literature provided I would recommend that with the follow-up research a bigger respondent group will be interviewed. The larger the interviewed group, the more the results can actually be based on truth.

Sub-question three was mainly focused on the misalignments. The main factor of misalignment according to the interviewees, and in line with the literature, were IT-related obstacles. Because the author and some interviewees think that IT obstacles will and can be overcome, it would be beneficial to identify the other four main drivers for misalignment. Because this research focused on the identification of the factors, the effect of these factors should be measured to find out what effect they have on the implementation of Blockchain. The different phases which benefit the most of an implementation of a Blockchain are identified. The question remains how the different misalignment factors could be overcome to actually start with the implementation of a Blockchain in the process. Further research on a more practical level is required to investigate the possibilities of implementation.

The explorative character of this research with a qualitative research design result in somewhat generalized conclusions and statements. In order to confirm these statements within this research, further follow-up research, which has been mentioned above, would be beneficial for the overall results. Besides this, this research functions as the base for further research on this subject. Further research would help identify the possibilities of Blockchain in the buying process. Our recommendation would be to identify a particular stakeholder and define their requirements for implementing a Blockchain.

12. Conclusions

This research intends to provide insight into the technological trend Blockchain with the deliverance of this description. It has been examined whether this trend can offer added value in the purchase process of commercial real estate. The idea here was to find out in which phase Blockchain can provide added value for the stakeholders involved in this process. From the research we can draw a number of conclusions:

1. The positive characteristics of Blockchain are mainly focused on the positive safety/security aspects of Blockchain. Interviewees determined that an implementation of Blockchain add value through the adding of safe and secure data sharing. Digital records of real estate assets and the re-design of processes were mentioned as the main positive aspects of the Blockchain.

2. There are some examples of blockchain implementation were it is applied, on certain levels, in the process, but due to the early development phase, we see that a large adoption by the majority of the people and businesses is not forthcoming. The greatest positive factor (safety and security) presented by the literature and interviews is to a large extent influenced by the fact that the system can still be hacked but it is difficult. Improving the security of the process of your business, changing overall processes, and switching to this system seems to be possible.

3. Looking at this result section the main obstacles which are experienced by the stakeholders are in the due diligence phase and pre-marketing phase. Keeping documents and made agreements secure seems to be a problem in these phases, which directly have an effect on the efficiency of the entire process. These phases also include the

most stakeholders, and because these phases are focused on collecting and checking data, most time spend and costs are incurred by the various parties in these phases.

4. Particular characteristics of the buying process influence the usability of the Blockchain. Especially, the experienced obstacles by the different stakeholders. Controlling, sharing and keeping data secure seem characteristics of the process which could be improved according to the interviewees and the objectives of the stakeholders. Controlling, sharing and keeping data secure which means that the positive aspects of Blockchain could best be implemented in these stages.

5. Controlling, and sharing documents could become more efficient by the implementation of Blockchain, which would have a positive effect on the duration of the process and therefore on the costs made in this process by the stakeholders. The question remains if Blockchain is the safest and mostsecure way of data sharing in comparing with the main situation of real estate.

6. A remarkable aspect worth mentioning is that the interviewees see possibilities for the advisory stakeholder. This is not really in line with the literature. One of the most mentioned positive aspects of Blockchain is the disappearance of third trusted parties. Although these parties should change their way of working, the total disappearance of these parties won't be the case due to their special knowledge in a part f the process.

The results have shown that the pre-marketing phase and due diligence phase are most suitable for the implementation of Blockchain. This due to the characteristics of the phases, characteristics of the stakeholders and the characteristics of Blockchain. The main aspect here can be focused on the added value of Blockchain as a data sharing program which could add value creating a more safe and secure way of sharing data. What should be mentioned is that the technology is in an early stage of development and therefore not (yet) suitable for the implementation in the real estate sector. Although multiple pilots and user cases could be mentioned, the technology needs to overcome some obstacles to be a beter success in the current buying process of commercial real estate.

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