Logistiek algemeen

Blockchain or no blockchain? That is the question

Blockstart: a cross case analysis of 17 blockchain feasibility studies

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Abstract

Blockchain is a new promising technology for SMEs. This paper analyses 17 blockchain feasibility studies in order to answer the question, in which cases blockchain creates value for individual companies and how does it create this value. The research is conducted by Windesheim and Rotterdam Universities of Applied Sciences and 23 consulting at small and medium size enterprizes (SMEs) that were acquired by the consortium partners of the Blockstart project. The data was collected by extended interviews, the results of which are categorised into 13 criteria. In the paper these criteria for the individual companies are compared and analysed. The results of the analysis are that blockchain can add value in most cases in three ways, the first important factor is cost reduction. The second one is enhancing existing processes which is often related to avoiding risks. Blockchain as a trust anchor can provide traceability of transactions and prevents costly disputes or provenance claims, creating a win-win cost reduction. Thirdly, blockchain can contribute to the market position of a company by creating a new playing field in an existing market. This can be reached by means of a platform for transactions, creating access to information that supports trust, in a secured manner. For these value adding factors the question whether to apply blockchain or not can be definitely answered by a 'yes'.

Introduction

Blockchain is a peer-to-peer ICT network that keeps records on digital transactions of assets using Distributed Ledger Technology (DLT). DLT means that there is no central party or intermediary, that would own the data, the exact copy of the dataset is stored at a number of computers, called nodes. At the nodes the transaction history is kept. This, in combination with its protection by cryptographic algorithms makes it safe from tampering (Min, 2019). Blockchain is a disruptive technology for logistic processes as it facilitates direct decentral transactions between parties in the supply chain, without the traditional cooperation of trusted third parties (Casino, 2019). Trust in intermediaries is replaced by trust in the program code and consensus rules (including smart contracts), which make well-applied blockchains safe (Capgemini, 2018). Blockchain has numerous possible applications, in health, education, privacy and security, business and industry, data management, finance, integrity verification, governance and Internet of Things (Casino, 2019). Despite the fact that it is a relatively new technology, there is a consensus in the literature about the prospects

of blockchain technology to make logistics processes more efficient. Kshetri (2018), based on 11 use cases, identifies the benefits of the application of blockchain in the supply chain as costs, speed, dependability, risk reduction, sustainability and flexibility (Kshetri, 2018). According to the Gartner Life Cycle of Emerging Technologies in 2017 and 2018 blockchain was situated at the end of the Peak of Inflated Expectations, meaning that it would take 5 to 10 years until the technology is applied widely. However, it is approaching the Through of Disillusionment, which is supported by the negative publicity that it has received lately (Gartner, 2017, 2018). A report of Capgemini (2018) enforces this. According to this report in 2018 the majority (87%) of the blockchain projects were no more than proofs of concepts (Capgemini, 2018). From 2019 blockchain has disappeared from the Gartner Life Cycle of Emerging Technologies. What is happening to this technology?

This paper explores the possible applications of blockchain at SMEs, based on a cross case analysis of 17 feasibility studies performed by the Windesheim and Rotterdam University of Applied Sciences and 23 consulting within the European Blockstart project. The Blockstart project is an European extension of the SIA RAAK MKB project on blockchain (RAAK. MKB08.012), which has also delivered a cross case analysis published in the Logistiek + Magazine (Lont, Paardenkooper, & Duin, 2021). This paper builds on the findings of the previous paper. The main lesson learnt from the Blockstart project is that for more academic rigour, the feasibility studies should be conducted using a standardised methodology with standardised variables. In order to achieve that, Heeroma-ten Katen has synthetised a scan consisting of existing methods in order to assess the applicability of blockchain for individual companies. (Heeroma-ten Katen, Duin, Lont, & Paardenkooper, 2020). Their method is used for the the feasibility studies in this project. This paper contains the analysis of these feasibility studies and addresses the following research question: "*In which cases does blockchain create value for individual companies and how does it create this value?*"

Section 2 describes the methodology and the process of performing the feasibility studies. In Section 3 the findings on the different aspects are compared and analysed. This is followed by the discussion on the limitations of the project in Section 4 and the conclusion is given in Section 5.

Methodology

The companies for the feasibility studies were SMEs from Interreg North West Europe regions, acquired by different regional partners (OostNL, Brightland Smart Services Campus, BioRegio STERN, University of Surrey, Chainpoint, Windesheim and Rotterdam Universities of Applied Sciences, Medicen and Multitel), which also form the consortium of the project. In the project 17 feasibility studies are conducted. 7 of the participating companies are from the Netherlands, 6 from the UK, 3 from Belgium and 1 from France. The majority of the companies, 11, were already existing companies, while 6 companies are startups. They are active in different areas: 7 in the food sector, 6 in the healthcare market, 1 in aviation, 1 in cosmetics, 1 in fashion, and 1 in geology. See Figures 1-3 for the visualisation of the demographics of the companies. The names of the companies are confidential, as well as the details of their business models and will be mentioned here only on the industry level. The unanonimised data set is stored at Windesheim University of Applied sciences. 11 of the feasibility studies were conducted by the universities of applied sciences, of which 7 involved students (under supervision) and 4 were done by senior researchers. The reason for this were delays caused by Covid 19. For the same reason 6 of the feasibility studies, are performed by 23 consulting.
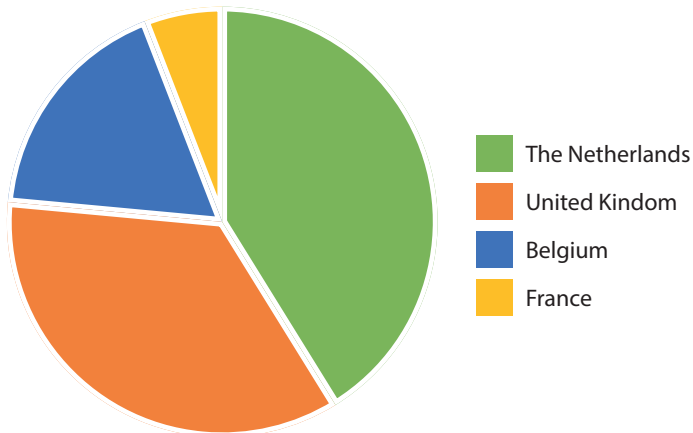
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Figure 1 The country of origin of the user cases
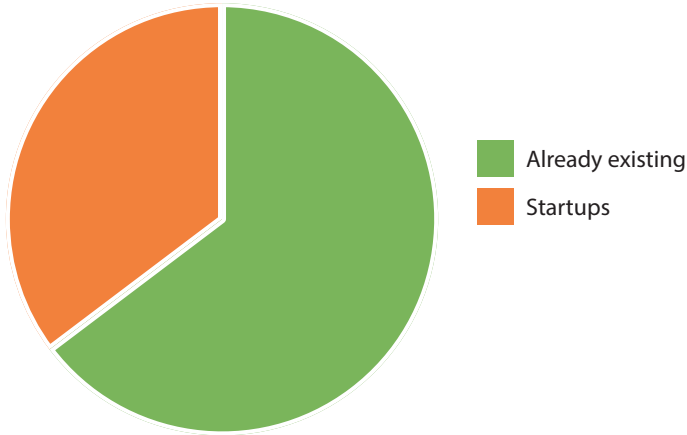
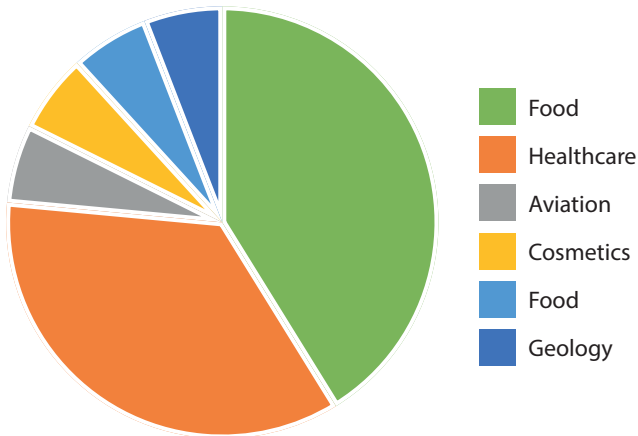**Figure 2** Ratio between already existing companies and startups

Figure 3 The market segment in which the companies operate

The first feasibility studies were performed by students using a 6 steps scan derived from the scan of Heeroma ten-Katen (Heeroma-ten Katen et al., 2020). Afterwards, because of the delays, a fast track of 5 steps was developed, inspired by the approach op 23 consulting, who gave our original methodology a more practical and reproduceable twist. The fast track was performed by the participating senior researchers. This faster approach was made possible by the accumulated knowledge during the project. This method is one of

the results of the project, which makes it possible to scan a company for the applicability of blockchain within a short period of time. The data was collected during 2 or 3 interviews of two hours. Firstly, the value proposition of the company was identified, including a SWOT analysis, secondly, the pains and gains of data management improvement were identified Thirdly, a process flow map in BPMN (Krogstie, 2016) was made of the company's processes, and the critical actors, stakeholders and critical processes were identified. Fourthly, the outcomes of the information analysis were matched with the opportunities provided by blockchain technology. Fifthly and finally the findings were verified and the conclusion about the application of blockchain was drawn. This was registered in a report and a presentation was given to the company, which they validated. The goal of the project was to provide the participating companies with knowledge about blockchain technology and to find out, whether companies can benefit from it and if yes how. If the advice was positive, the companies got an opportunity to apply for a second voucher in order to develop a proof of concept. From the 17 discussed cases 13 companies have received a positive advice for the implementation of blockchain, 9 companies have received voucher 2, which means that they proceed towards a proof of concept.

When all 11 feasibility studies performed by the universities of technologies were completed, the results were categorised and entered in a work sheet for the analysis. The work sheet contained the following variables: type of organisation, branch, value proposition, success factor, business model, process flow, actors and stakeholders, critical information flow, information issues, pains and gains and matching opportunities. The remaining 6 cases, the healthcare ones, were performed by 23 consulting. 23 consulting also conducted extensive interviews and its research consisted of the 5 steps described above. After completion of all the feasibility reports a calibration took place with the team of the Universities of Applied Sciences and the results were categorised and entered into the common work sheet. This way the details of all the 17 use cases could be used for a reliable analysis.

Analysis

In the analysis the results are compared according to the variables mentioned above.

Types of companies

As mentioned above, there were two types of organisations distinguished: longer existing companies and startups. The majority of the treated SMEs (11) were longer existing companies, the minority (6) were startups, some of them yet only existing in name. An overview of the types of companies is show at Figure 2. For longer existing companies adopting blockchain is more challenging as many of these companies have already invested in their ICT and therefore they are not open to make new changes with a technology that

has a limited track record in real applications. The existing companies were mostly trying to optimize their existing processes by the use of blockchain while adding new features, for example traceability trust and risk avoidance. The startups represent the business models of the future, creating new processes, especially through the establishment of platforms. In this sense blockchain can be seen as a vessel of innovation, opening new opportunities for transparent and safe communication between stakeholders. Transparency has value for both tracing and tracking. Tracing serves trust because provenance is shared, and the source of information is verified. It prevents disputes and serves analysis for process improvement. Tracking allows for more agile supply chains because current transaction data is securely shared which can improve anticipation.

Branch

As mentioned above, the treated cases belong to different branches, 7 of them to the food sector as there traceability, reliability and sustainability play an increasingly important role. 6 cases are from the healthcare branch, which is caused by a bias in the sampling. One of the consortium partners, that was acquiring the SMEs was Medicen, a major life sciences cluster of the Paris Region. For the rest a variety of sectors are represented, especially the ones, where trust, provenance and sustainability play an important part, such as aviation, cosmetics, and geology. The overview of the branches of the companies is shown at Figure 3. The 2 companies that have received negative advice for the implementation of blockchain were form the healthcare and the geology sector. The first one had a negative advice, because the concept was not worked out well enough. The second company got a negative adivice, because the implementation would cost too much, while there was no clear customer demand.

Value proposition

In 8 of the cases the value proposition was based on risk reduction, 6 on cost reduction, 3 on the increase of market position or access. In the remaining cases the value proposition was based on access to care, the improvement of health, information access and compliance with regulations. The numbers do not add up to 17, because in some cases there was a combination of the factors, such as in 3 cases costs combined with risk reduction, and in one case costs combined with market position. Figure 4 shows the value proposition of the different companies. The concept behind the value proposition was most often (in 8 cases) striving to more business transparency, in the case of information access acting as a middleman, in two cases sustainable development goals and in two cases (juridical) compliance was mentioned.
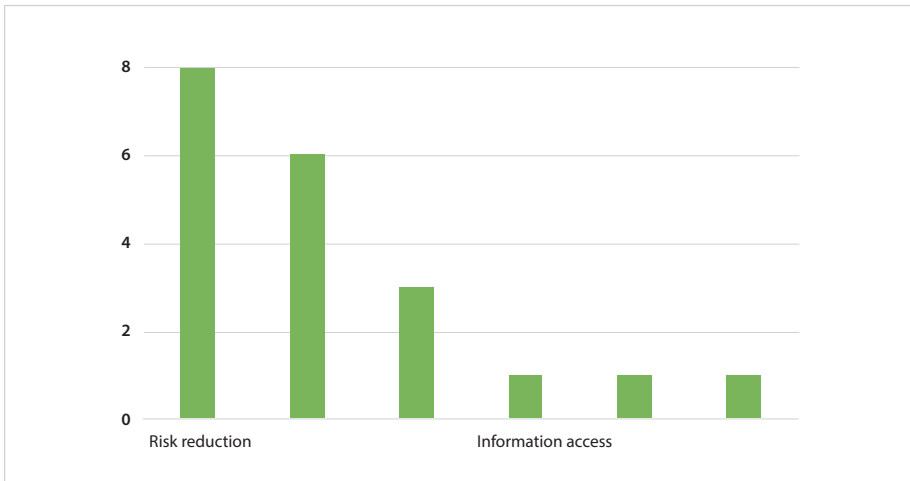
Figure 4 The value propositions of the different companies

Success factors

The success factors are derived from the VRIO analysis (Barney, 2010), which addresses after establishing the value of the service or product, how rare and imitable it is and how well the process of the company is organised. The success factors can be divided into ones related to the company's and the data's. The success factors of the companies are related to their market position, a broad network and progressive IT knowledge were mentioned. Related to data quality speed, accessibility, reliable, single point data were listed, and their use for tracking, making it available and using it for compliance.

These success factors have in common, that they provide reliable information for optimizing processes, or connect parties for specific collaboration. This data provision qualifies for being data as a service, which is a part of the new economy based on data. Data is called the new oil on which the digital economy runs. It has major value, and these companies wish to exploit this in their business model with the help of blockchain.

Process flow

Process flow scan be categorised as linear and platform or the combination of the two. 7 of the companies wished to apply blockchain for linear flows, 9 for platforms and 1 for the combination of the two. In linear processes blockchain is used for increasing trust, providing evidence of provenance often for proving sustainability and reducing risks. Platforms are ways of coupling possible stakeholders and providing means for safe communication between them. In this case the platform performs the function of a middlemen and the business model is requesting fees for its usage and in some cases providing consultancy.

Actors and stakeholders

During the interviews the stakeholders of the companies were discussed. Some operate in a bigger or a smaller market, there is not much to say about the number of stakeholders. These companies, however mostly operate in a niche. One of their major success factors, as will be mentioned later, is their thorough knowledge of the market segment. In case of a linear process flow, the stakeholders are mostly the actors in their own supply chain and regulators. In case of a platform, they connect different parties as a kind of market place, providing a service comparable with parties as Takeaway, Uber and Booking.com. Blockchain provides the transparency and trust in the process.

Critical information flow

The critical information flows belong to different processes. In 6 cases blockchain was intended to be used for quality control and provenance, in 4 cases in two cases for data access and sharing in 3 cases for the tracking of maintenance, in one case combined with customer rating. Further the processes were: sales, customized product allocation, storage of personal data and lifecycle tracing. Figure 5 shows the critical information flows in the different cases.
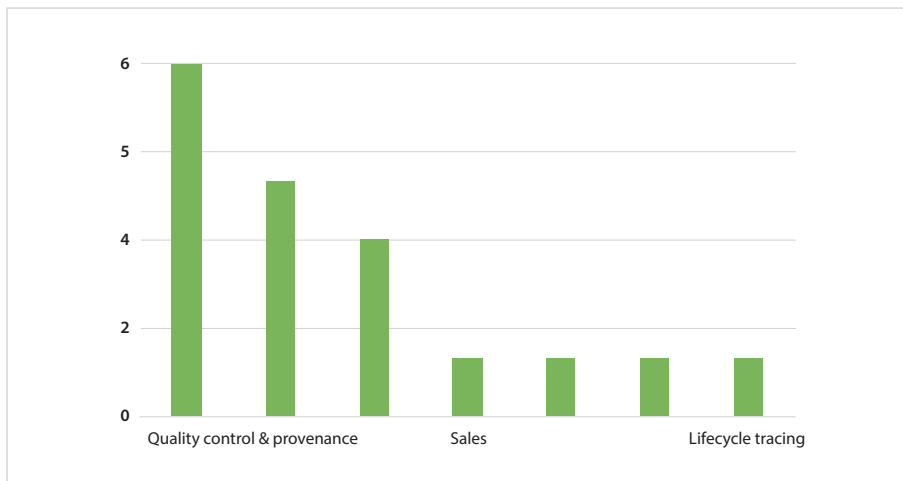
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Figure 5 The critical information flows of the different cases

Information issues

The major information issues were accuracy and integrity, trust, completeness and correctness, timeliness, control and accessibility and security of the data. In a few cases control, relevance usefulness and the complete lack of an information flow are mentioned. Figure 6 gives an overview of the information issues of the different companies. The fact that the companies mentioned these challenges, shows that they rightfully look for the solution in the form of blockchain as it has the capacity to solve these issues.
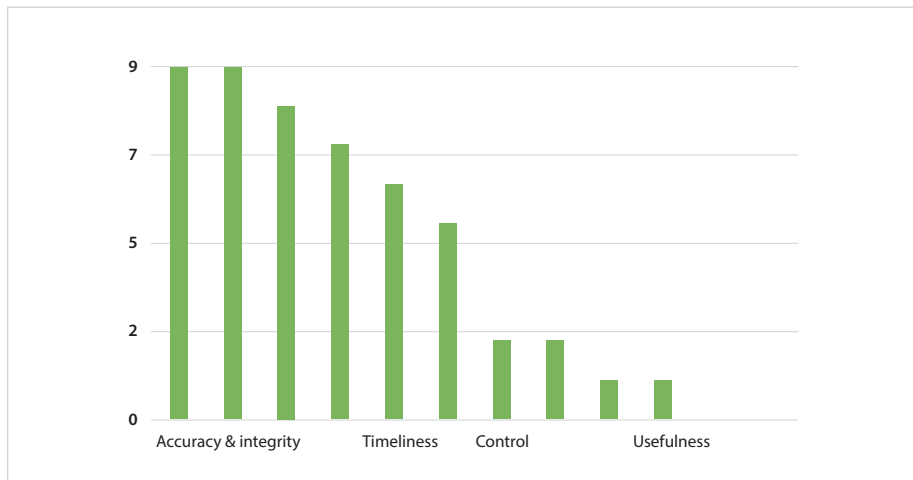

Figure 6 The information issues of the different companies

Pains and gains

The pains that the companies intend to relieve are quite diverse, because they are related to the concrete activities of the company. They vary a lot: from the lack of data sharing, cumbersome paperwork at a hackable system, possible tampering with products, in two cases the lack of reliability of the existing data, uncertain origins of products, the weakness of claim verification, in order to gain customer trust, food waste, due to inaccurate forecasting, uncertainty about verification of certification, insecurity of specialized product allocation, lack of accessibility of the right documentation, unclarity of the state of maintenance of parts, problems with splitting payments, lack of access management to qualified data, problems with data integrity and disputes about the time spent on certain tasks. These problems are related to the challenges in mentioned in the previous paragraph. Listing the gains conjures up the description of blockchain in the introduction, safe data sharing and monitoring, while the correctness of the data is guaranteed by the immutability of blockchain. Clearly, in most of the cases blockchain is the answer. Blockchain can do that

by turning the pains around by using gain creators. These are in the cases: uniqueness of services, verification and validation that the system provides, allowing for collaborative work, both customization and standardization. Curiously, while blockchain is a generic technological solution, in the threated cases it would offer a customised solution in the specific market segments, where the companies operate, using their knowledge and network.

Discussion

This paper discusses 17 blockchain feasibility studies of SME. Having learned from the previous project, the feasibility studies are conducted in a more standardised way and the variables are better defined and calibrated. Still the practical impediment is that the research was done using different steps, has posed a challenge, which was solved by calibration. However, there is still some place left for interpretation. Furthermore, the SMEs joined a project called 'Blockstart', which assumes they all had an interest in a possible blockchain application in their business. A more neutral population, with for instance in interest in 'digitalisation', would be interesting to scan. Further research should have a more neutral label. The number of feasibility studies was a bit low for extracting general conclusions. Further research should be extended to more cases in different sectors, preferably with more cases from the same sector. It is still of outmost importance to use a standardised approach.

Conclusion

From the research it can be concluded that blockchain is certainly not out of the picture. Its applications are widely considered by SMEs. From the 17 discussed cases 13 companies have received a positive advice for the implementation of blockchain. From out of the 13 companies 9 companies have received voucher 2, which means that they proceed towards a proof of concept. The answer to the research question of the paper is that blockchain can add value in most cases in three ways: the first important factor is cost reduction. The second one is that the extension of existing processes is often related to avoiding risks. BCT as a trust anchor can provide traceability of transactions and prevents costly disputes or provenance claims, creating a win-win cost reduction. Thirdly, blockchain can contribute to the market position of the company by creating a new playing field in an existing market, which can be reached by means of a platform for transactions, creating access to information that supports trust, in a secured manner. This creates a win-win market positioning. A trigger for innovation is either the need for a different playing field (improve competition, make markets accessible, deal with legislation) or the use of new technology that generate data perceived as valuable (IoT, sensoring, etc.)

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