BI Norwegian Business School - campus Oslo

GRA 19703

Master Thesis

Thesis Master of Science

Blockchain from a new point of view: A descriptive analysis on whether the technology can create value in credence goods.

Navn:	Jasin Kammas Nordheim, Nicolai Lenouvel Hansen

Start:	15.01.2020 09.00
Finish:	01.09.2020 12.00

Master Thesis

Blockchain from a new point of view: A descriptive analysis on whether the technology can create value in credence goods.

By:
Hansen, Nicolai Lenouvel
Nordheim, Jasin

Course Code and Name:
GRA 19703 – Master Thesis

Hand-in date:
25.06.2020

Place of study:
BI Norwegian Business School Oslo

Supervisor:
Ragnhild Silkoset

ABSTRACT

Blockchain, a technology that has been receiving an increased amount of attention lately, has the potential for many great things in a marketing perspective. While little research has been done from such perspective, this study will help to shed some light on this new setting. Therefore, in this study, the aim is to provide an answer to whether blockchain can create value for customers within credence goods. In relation to this, blockchain and its many characteristics have been identified and analyzed, with its' main features being transparency, traceability and tamperproof. These characteristics were used to test how blockchain as a whole has an effect on customers' perceived value, through mediations from information asymmetry and customers' perceived risk. The basis of this is applied to a survey, where we gathered people who purposely consume organic products in Norway. Our findings indicate that perceived risk and information asymmetry mediate the effect blockchain has on customer perceived value and establish the relationship between perceived risk and perceived value. Also, this study found indications that blockchain can be used as a means to reduce information asymmetry within credence goods, which is the root of what Akerlof (1970) formulated as the market for lemons problem. Consequently, managers could adopt this technology to increase customers' perceived value, as this will in turn increase loyalty.

Table of Contents

Acknowledgements

Writing this thesis has been a long, interesting and challenging journey. We are very proud of what we have created, and for the knowledge that we have gained through this experience.

We want to give our sincerest gratitude to our supervisor, Ragnhild Silkoset, for giving us the best guidance we could have ever imagined.

We also want to thank our family and friends for the support and motivation that they have given us through our journey.

This marks the end of a chapter for us, and it could not have ended in a better way.

1.0 Introducti

Recently, blockchain has received an increasing amount of attention from many industries. Its' potential is greater than what people imagined, and researchers are just scratching the surface on how far this technology can help to advance certain industries. The focus on this thesis will be from a marketing perspective, where the attention is faced towards whether blockchain can create value within the market of credence goods. The aim is to identify whether blockchain is able to affect customers' perceived value within the market of credence goods. In addition, previous research has shown that blockchain is a means to reduce information asymmetry within experience goods (Zavolokina, Schlegel & Schwabe, 2020). Therefore, we will through this study see if the same applies to credence goods and whether information asymmetry has a direct effect on perceived value. Further, customers experience a certain amount of risk when faced in front of a purchase. Hence, it will be interesting to see whether blockchain affects customer's perceived value (CPV) through perceived risk and/or whether perceived risk affects perceived value directly. Hence, the research questions are given:

Research question 1: *To what extent is blockchain technology and its' characteristics able to reduce information asymmetry within credence goods?*

Research question 2: *To what extent is blockchain technology and its' characteristics through information asymmetry and perceived risk able to increase customer's perceived risk within credence goods?*

According to Animesh, Ramachandran, & Viswanathan (2005), individuals can never be certain of the quality and value of credence goods even from ex post observations. Indeed, organic food falls into this category because consumers cannot distinguish a non-organic product from an organic one just by looking/feeling it or consuming it. While it is possible to know that they are organic thanks to their labeling, there have been numerous cases where some products are either just a little organic or where non-organic products are sold as organic (Glebova, Larionova, Zaitseva, Grunina, Chvyakin, Takhumova & Glagoleva, 2019; Sternfeld, 2009). In addition, Mironenko (2018) proved that "the

volume of organic counterfeit is estimated at more th
et.al., 2019, p.541). Therefore, consumers have little trust in the labeling process of organic products, consequently affecting loyalty, leading to the failure of the organic food market (Giannakas, 2005). Furthermore, organic food and beverages amounted to €40.7 billion in 2018 in Europe. A growth of 7.8 % from 2017 to 2018 (FIBL, 2020). Hence, it is a market with growing importance.

In a general sense, sellers possess more information about the product than buyers. This information might be intentionally hold back from the buyer as it may not be relevant for them to know, or it can affect their willingness to pay. This leads to the market for lemons problem identified by Akerlof (1970), where he argued that there is a large presence of information asymmetry. Relating this to credence goods, and more specifically to organic products, the seller is the only party that can know how organic their product is. Hence, consumers experience a certain amount of risk because their knowledge about the products is fairly low. Most organic products are more expensive than non-organic products, and it is the foremost reason why consumers do not buy it (Hill & Lynchehaun, 2002). Therefore, if someone were to sell a non-organic product stamped as organic, they would make more money from it, which would result in a financial risk for the buyer. It could also be a psychological risk, where if the buyer is pro-organic products and later finds out that he/she bought a non-organic product, it could be detrimental for their self-perception. These are only two of the many risks that consumers experience. To lower the risk customers perceive, they can gather information (Crocker 1986; Davis, Guiltinan & Jones, 1979). Also, an important annotation is that credence goods, out of all the goods have a higher risk because of limited access to information (Mitchell, 1999).

This is where blockchain technology (BCT) works at its finest. “Blockchains are a way of ordering and verifying transactions in a distributed ledger, where a network of computers maintains and validates a record of consensus of those transactions with a cryptographic audit trail” (Seibold & Samman, 2016, p.2). While blockchain received a lot of attention due to the emergence of bitcoin, many of its’ characteristics can be used further in other industries. In this study, six characteristics of BCT have been identified. However, there are two that receive more attention in the literature, as they have a greater impact than the

others. The two in question are traceability and trans
ability to track a product batch and its history through the whole, or part, of a production chain from harvest through transport, storage, processing, distribution and sales or internally in one of the steps in the chain for example the production step" (Moe, 1998, p.211). In addition, according to van Donk van der Vaart, Awaysheh & Klassen (2010), transparency is identified as being information that is available for both counterparties in an exchange, and also for outside individuals that would like to access such information. These two characteristics enables buyers to level out information asymmetry within experience goods (Zavolokina et.al., 2020). Associating this with the organic food market, as blockchain has been able to reduce the asymmetry within experience goods, it might be able to reduce it for credence goods. Hence, addressing this problem further in the research.

Furthermore, an important concept to succeed in marketing and business is the concept of "value" which is key for long term success. The customer value-concept is considered an important outcome when focusing on consumption experiences (Babin, Darden & Griffin, 1994; Holbrook, 1986; Morar, 2013) and perceived value has by Parasuraman & Grewal (2000), been argued to be the most important indicator of repurchase intentions (Morar, 2013). Repurchase intentions are closely related to customer loyalty- making perceived value a very important concept that should be payed a lot of attention. This because it is ten times more expensive to acquire a new customer than to maintain one (Heskett et al., 1990; Morar, 2013). Hence, focus should be directed towards delivering value which "will increase the shopping intention of consumers by creating and delivering good shopping experiences" (Morar, 2013, p.169).

2.0 Literature review

The areas of interest for this thesis touches upon several diverse topics. Consequently, the reviewed literature does not only reflect on one theory or one single concept. This part will build on a foundation from where we build our conceptual framework. Therefore, the presented theoretical concepts are aspects associated with the numerous concepts introduced in the introduction and research questions. First, to explore the research questions, there needs to be a better understanding of what blockchain is and how it operates.

2.1 Blockchain technology and how it works

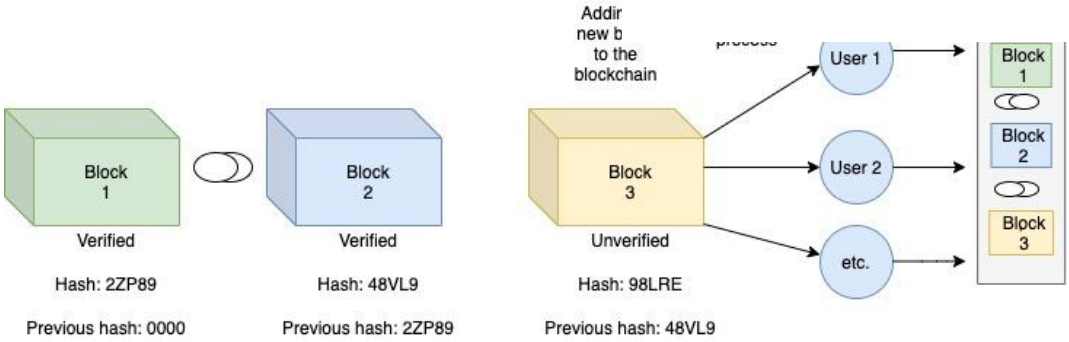
Blockchain technology has received a lot of attention these past couple of years, and its popularity increased after being adopted by Bitcoin. However, the technology itself was first introduced in 1991. Back then, it was intended to timestamp digital documents so that it would not be possible to backdate them or tamper with them. It was not until the creation of Bitcoin by Satoshi Nakamoto in 2009 that the usage of the technology was known worldwide. In addition, while it was mostly directed towards the financial market, the later years have stressed the relevance of using such a technology in other industries.

According to Crosby, Pattanayak, Verma & Kalyanaraman (2016), 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. Each transaction available in the public ledger are accordingly verified by participants in the system. Once the information has been uploaded to the ledger, it is difficult to change it and it cannot be erased. In addition, the distributed ledger is completely open to anyone, meaning that anyone can add information (Sharples & Domingue, 2016). However, there are some issues that still have not been solved. As mentioned above, participants in the system have to approve the published information, and since it is a public ledger, no third party can verify this information. Therefore, there is uncertainty concerning who will verify the published information to be correct. This also raises another question, being if the information that will be published is at all correct, as it will have the need of experts that can verify it (Zavolokina et.al, 2020). This issue will be addressed further in the study, where the different architecture options will be brought to light, which will help to explain how information can be verified. Continuing on

the problem of whether information is correct or not,
(BCT) assures that once the batches of individual transactions or activity are published and validated, they cannot be reversed or amended. Therefore, there will be a presence of misinformation if no third-party experts are appointed to verify it. Presently, there is limited research on BCT, hence there are numerous questions that remain unanswered. This study will hopefully help to fill the gaps.

Following, we will provide a holistic review of BCT and how it operates, with a visual interpretation given in Figure 1 below. "Blockchain technology refers to a distributed database that maintains a continuously growing list of data records that are secured from tampering and revision" (Chang, Katehakis, Melamed & Shi, 2018, p.2), consisting of blocks holding batches of individual transactions. Each block contains some data, the hash of the block and the hash of the previous block. The data stored in each block varies depending on what type of blockchain is used. The bitcoin blockchain for example is a cryptocurrency. It is similar to a bank in a way that both work with financial transactions. However, they differ in decentralized and centralized control. BCT, which implements decentralized control, makes it possible to acquire details about a transaction, such as who the senders and receivers are, as well as the amount of the transacted money. This will be the data stored in a blockchain.

Furthermore, the hash of the block contains numbers and letters and can be assimilated with QR-codes, in a way that each hash is unique. The hash is calculated when a new block is created. Also, this new block (Block 3) will need to be verified by all the users who belong to the blockchain. When it has been verified by all the users, it can be added to the ledger, with the other belonging blocks. Moreover, changing the contents of the block would cause the hash to change, making it useful to easily detect the changes to a specific block. If someone were to try and change block 2 from figure 1, then its' hash would change instantly. This in turn would make the following blocks invalid, as they no longer contain a valid "previous hash".



Model 1: *Blockchain process*

As blockchain can be used in different settings, there needs to be an understanding on how they can utilize the technology differently. Following, we will take a closer look at the architectures that blockchain is able to offer and how they differ from each other.

2.1.1 Blockchain Architectures

Carson, Romanelly, Walsh & Zhumaev (2018) identified four different options of blockchain architecture; public permission less, public permissioned, private permission less and private permissioned. The architecture of the technology itself will depend on which industry one is in, as companies have different requirements and want to offer different solutions to their customers. They also state that most commercial businesses will utilize a private permissioned architecture, where only authorized people can join and read, where only network operators can write and commit. These two privately owned data infrastructures (private permissioned and permission less) will be most beneficial in a B2B contexts, since the information that will be available on these platforms will be of interest to companies performing transactions. This would also mean that the participants will not be anonymous, in contrary to the public ones. Not knowing who publishes the information would be useless for the users belonging to the block. The use for B2B companies can for example be in the form of using smart contracts, where money transactions will take place when the end customer receives the product, and when they have made sure that the product has not been tampered with. The need of middlemen that normally would be in charge of assuring that the correct paperwork is in order would be reduced. Hence, companies are able to cut down their costs.

On the other hand, there will be companies that will l
one of the two publicly owned data infrastructures (public permissioned and permission less). What differentiates both infrastructures is that the permissioned one allows any individual to write in the blockchain. In contrary of the privately-owned infrastructures, these will mostly be used in B2C contexts, where the consumer will benefit from the information held in the blockchain. They will for example be able to attain knowledge that could have an impact on their decision of whether to buy a product or not. If a consumer wants to buy a product but also wants to make sure that the production and transportation of the product is sustainable, they will be able to acquire that knowledge with the use of BCT, assuming that the company the consumer wants to buy from utilizes such technology. Also, when buying a used vehicle, they will be able to acquire knowledge such as how many collisions a car has been in, which will decrease the value of the car. This because there is normally presence of information asymmetry in such conditions. Consumers will then be able to get a more accurate valuation of the car using such information. We will come back to this later in the thesis.

Following, an overview of the six blockchain characteristics that have been identified through previous literature will be given.

2.1.2 Blockchain characteristics

Here, we will examine why BCT is unique compared to other technologies, and the advantages that its' characteristics provides. This will enable us to better explain how blockchain has an effect on the other identified concepts.

Transparency

First, we have transparency. According to van Donk et. al. (2010), transparency is identified as being information that is available for both counterparties in an exchange and also for outside individuals that would like to access such information. Information such as how a product is produced, where it is produced, how it was transported etc. Today, this information is intentionally unavailable for the end consumer, but it can be beneficial for some individuals to know, as it can affect their choice when it comes to which product to buy. Indeed, consumers are increasingly interested in product origins and demand for sustainable

transportation (Carter & Rogers, 2008; Svensson, 20
transparent would not only be advantageous for the consumers but also for the firms adopting it, because consumers would have increasing trust in the company. Indeed, "information sharing generates and improves relationships between suppliers and customers making transactions more efficient*"* (Lamming, Caldwell, Harrison & Phillips 2001; Badzar, 2016 p.35). However, there is need for good coordination between all actors that have an influence on the production and transportation of the product for the system to be successful.

Traceability

Second, we have traceability, that differs from transparency in terms that individuals will be able to access timestamped records. Both transparency and traceability are correlated in a way that having more information available (i.e. transparency) can lead to increased traceability. However, having more traceability does not lead to increased transparency. According to Moe (1998, p.211), "Traceability is the ability to track a product batch and its history through the whole, or part, of a production chain from harvest through transport, storage, processing, distribution and sales or internally in one of the steps in the chain for example the production step". Goods and similar documentation, when passed from a supplier to another are often items that are subject to theft or counterfeiting. In order to mitigate this, BCT creates a digital token which can identify the physical item. When the product reaches the end customer, they can authenticate the token which will then give them access to the entire history log of the item. Hence, they will have more confidence in the information they obtain because no one entity or group of entities can change the information contained in the blockchain, which brings us to the security of blockchain.

Security

Another unique characteristic of BTC is its security, making it very difficult to tamper with. What is unique about the technology is its use of "proof-of-work", which is a mechanism that slows down the creation of new blocks (Chang et.al., 2018). This mechanism uses puzzles that need to be solved to validate the credibility of data (Li, Jiang, Chen, Luo, & Wen, 2020). In other words, a puzzle needs to be solved in order to create a new block. This puzzle will then be sent to other nodes that need to validate it. Changing a part of the block would require all

other blocks to no longer be valid because they no lo
the previous block, which in turn makes it easy to find which block has been tampered with.

Also, data security is strengthened by being a distributed technology, as it uses a peer-to-peer network that anyone can join. These people or companies that have joined the network keep a copy of the blockchain on their device called “nodes”, which are individual parts of the larger data structure that is a blockchain. Consequently, they can verify that everything is still in order because when a new block is created, it is sent to everyone that have joined the network. Further, to make sure that the block has not been tampered with, each node has to verify it. After being verified, the nodes can add this new block to their own blockchain, creating consensus because they agree on what blocks are valid or invalid. If one were to try and tamper with a blockchain, they have to tamper with all blocks attached to the blockchain, redo the proof-of-work for each block and take control of more than 50% of the peer-to-peer network. Only then can the tampered block become accepted by everyone else. Nevertheless, this is almost impossible to do, making blockchain an extremely secure information storing technology.

Confidentiality
Since BCT is a peer-to-peer network where all belonging to the same network can see each other’s activity, it raises another question. One being if the confidentiality of its users remains intact. In order to preserve its’ user’s privacy and data, BCT appoints pseudonyms and advanced cryptography to hide some aspects of their activities (Chang et. al., 2018, p3). Hence, acquiring sensitive information about the nodes in the network is made sure to be harder to obtain.

Immutability
Furthermore, BCT ensures that information that has been validated by the nodes on the network cannot be changed or deleted. This feature will further be called for immutability. Ateniese, Magri, Venturi & Andrade (2017) explained this mechanism with the representation of locks in between blocks. When a block is locked, it cannot be changed and therefore is immutable. In order to lock a block, the information needs to be validated by the nodes. Only then the block will

become immutable. Information that has not been va
to be assessed by the nodes. In this state, information can be modified or deleted. However, this raises some questions, such as if the information is outdated for example, it cannot be altered. Still, new information can still be added to the ledger, meaning that correct information can be found on the ledger, but it will mean that individuals need to use more time in assessing if the information is correct and up to date. This somehow brings us back to efficiency, as people would need to use more time on assessing the correct information.

Efficiency

Sixth, BCT improves efficiency by replacing the need for a centralized database (Chang et. al., 2018). The technology eliminates the need of a third party to maintain the database. Instead of trusting a third-party, one will need to trust the data on the blockchain. This would imply that transaction processing time and cost can be reduced. They can for example reduce cost and time by employing smart contracts that rely normally on extensive manual paperwork (Guo & Liang, 2016). Also, companies will not need to review as much documentation to complete a deal because everyone would have access to the one and only version. However, since BCT is a peer-to-peer network, it means that all nodes in the network will need to verify each transaction. This repercussion would have an increasing importance as the nodes in the network augments. Hence, it could also potentially decrease efficiency (Guo & Liang, 2016).

2.2 Search-experience-credence framework

As we are trying to investigate how BCT will affect credence goods, it is important to provide adequate information about the two other different types of goods, search and experience goods.

Attributes of goods can be classified into three different categories: Search, experience and credence goods. «These properties are used to categorize the point in the purchase process when, if ever, consumers can accurately assess whether a good possesses the level of an attribute claimed in advertising» (Ford, Smith & Swasy, 1990, p.433).

First, with credence goods, in contrary to experience
never be certain of the quality and value of credence goods even from ex post observations (Animesh et. al., 2005). A good example for explaining this attribute is organic foods. Presently, both organic and contemporary foods are similar in many ways. One can feel both products, consume them in the same way, but distinguishing them based on taste or touch is difficult. The way they differ from each other is in the way both are produced. Hence, it is hard to distinguish both products if it were not for the fact that organic products are labeled as organic. Therefore, one also does not know the true value of the product even after having consumed it.

Second, search goods are products that one can assess by plainly looking at them as well as touching them before making a purchase, meaning that one can also evaluate its price and value. When going to the supermarket, one can feel the products and see the price before purchase. Hence, one can also determine whether the product is ripe or not, knowing the true value of the product.

Third, experience goods need to be experienced or consumed so that one can appreciate its features (Nelson, 1970). One can know the price of the product, but the value of it cannot necessarily be identified unless the product is consumed. That is why people often assume that the value of the product is determined by its price. A good example for experience goods is a haircut. Before the haircut, one can know the price and maybe the reputation that a hairdresser has. However, one cannot determine whether the haircut will be good before it is done.

Following, we will introduce the market for lemons problem, as there is much information asymmetry between buyer and seller, which can result in buyers overpaying for a product, especially for credence goods.

2.3 Markets for lemons

When faced before a purchase, consumers have some information about a product. The provided information will have an effect on their choices, where the more information they possess, the more certain they are about what choices to make. However, in some situations, limited information can lead to bad purchases.

Hence, the concept of "market for lemons" is introdu
down explain how BCT can help to reduce the information asymmetry.

Akerlof (1970) introduced the concept of the market for "lemons", which relates quality and uncertainty. Akerlof used the market of used cars as an example in order to describe the problems of information asymmetries and quality uncertainty. This due to the fact that the used car market is characterized by uncertainty and lack of trust (Zavolokina, Miscione & Schwabe, 2019). In such situations, there is a high level of information asymmetry, where the seller possesses all the information about the product. Therefore, they can demand a higher price compared to the quality of the car. In addition, assuming that the seller is the first owner of the car, he or she holds valuable information such as the car´s entire history with damages and repair. Hence, as buyers do not know the true value of a product, the price of a lemon will be equal to the price of a higher quality product. This would inevitably make the lemons drive out the high-quality products out of the market, as it has been described in Akerlof's study. Therefore, the buyer has to trust the seller to provide accurate and authentic information.

Moreover, Mocan (2007) performed a study where he tested whether consumers would detect lemons, within the market of childcare. First, consumers do not utilize all available information when forming their assessments of quality. Second, consumers are weakly rational. Third, consumers are trying to determine quality by assessing other ques, like for example surroundings in a building. However, "this leads to adverse selection in the market" (Mocan, 2007, p.774). Finally, customer characteristics, such as their profession, affect their accuracy in the predictions. In other words, if consumers have the possibility to use a technology that will give them complete and reliable information about the product that they wish to buy, it might be that they will not exploit this technology.

2.4 Perceived Risk

Information asymmetry is indeed an ongoing issue, where buyers might overpay for a product because of the limited information provided by the seller. Due to limited information, buyers experience a certain amount of risk pre- and post-

purchase. Therefore, this section will revise literature
risk.

Before, during and after making a purchase, consumers are faced with a certain amount of risk. For example, a consumer can be faced with the possibility that the product will not function as intended, and they can risk having to invest more time to make sure that they get a fully functioning product. Studies show that for shopping and convenience goods, "in general, higher value, more complicated and more involving products are riskier than the lower value, low-involvement simpler convenience products*"* (Mitchell, 1999, p.174). Knight (1948) argued that risk is a known probability. Indeed, consumers can calculate the risk before making a purchase by gathering information. The more information they get ahold of, the lower the risk is to make a bad purchase (Crocker, 1986). Moreover, different types of goods weigh risk differently, meaning that search goods have for example a higher importance with psychological risk while experience goods have more a financial risk (Derbaix, 1986). In addition, Mitra, Reiss & Capella (1999) found in their study that consumers perceive a higher amount of financial, functional, social and psychological risk when buying a credence service. Following, the different types of risk will be identified.

There are numerous dimensions of risks, which can be assembled into one overall perceived risk. Jacoby & Kaplan (1972) collected five types of perceived risk within a hypothetical purchasing situation, naming it overall risk. In addition, they included a sixth important risk which was identified by Roselius (1971), namely time risk. First, we have functional risk, being the uncertainty a consumer has to if the product/service will function as intended. Second, we have financial risk, which is the amount of money invested when the purchase occurs as well as in the future. Third, we have social risk, where one can diminish their social status among their peers by buying a product that is disapproved by their friends. For example, assuming that a person is wealthy, they may not purchase a cheap watch because of the fear of disapproval from social surroundings. Fourth, physical risk is the risk of buying a product that can physically harm someone. Fifth, psychological risk is how the perception consumers have on themselves will be affected after purchasing a product/service. If someone that is pro-sustainability decides to buy a product that is not sustainable, they can diminish their self-

perception. Finally, time risk is when a product fails
which leads to people wasting time, effort and convenience to repair or replace it.

2.5 Search cost

"Search cost is the time, energy and money expended by a consumer who is researching a product or service for purchase" (Halton, 2019, p.1). Individuals will put more effort in trying to buy a product that answers their needs. They will have to gather information about products on many different platforms and compare their findings to other similar products. From the time they start their research on a product until they buy it, is the search cost. They use valuable time and energy on gathering enough information that will help them to acquire enough knowledge about what product to select. Moreover, Bakos (1997) argued that markets with differentiated products make the search problem buyers face more complicated, as individuals need to consider both the price of a particular seller and product attributes. They will have to compare several brands when they want to buy a product, where the information they gather has to be critically analyzed with help from many different platforms. Therefore, reducing the time and information costs will be attempted by most consumers (Stigler, 1961). Consumers will search for goods and services up to the point where the marginal benefit of search is equal to the marginal cost of search (Ekelund, Mixon & Ressler (1995).

Both search cost and perceived risk are interrelated. Recalling to what search cost is: "the degree of attention, perception, and effort directed toward obtaining environmental data or information related to the specific purchase under consideration" (Beatty & Smith, 1987; Schmidt & Spreng, 1996, p.247). What has not been identified is the reasoning behind why a consumer indeed uses time, money and energy before a purchase. Before making a purchase, consumers have a range of products or services in which they can choose to invest in. There are numerous products and services, which are similar to each other on several points and different on others. Giving them an opinion of what purchase would fit their needs more accurately. Indeed, Taylor (1974) defined risk as being the uncertainty about the outcome and consequences. In his article, he stated that it is possible to reduce risk by acquiring and treating information. Therefore, consumers need to

assess the quality of the products/services before mal
get an idea of how big the risk is to make a bad purchase.

2.6 Customer Perceived Value

There are several inconsistencies in early research on CPV, due to it being a complex matter, especially when it comes to the concept of value. Sanchez-Fernandez and Iniesta-Bonillo (2007) identified two research approach trajectories; The first being a one-dimensional approach, which is perceived as being too "narrow", "arcane", or "simplistic" to what customers actually experience (Morar, 2013, p.173). The second approach is a bi-dimensional approach which include an affective and functional dimension to examine purchasing behavior (Morar, 2013, p. 173; Woodruff, 1997; Sweeney & Soutar, 2001; Sánchez et al, 2006). These authors argued that the functional value is determined by a rational one, and also by consumers' economic evaluations and quality of services (Morar, 2013, p.173). On the other hand, Zeithaml (1998) has a different approach, where he uses more specific dimensions (benefits and cost) rather than abstract concepts. Her approach will be used further.

Zeithaml (1988) suggested that CPV can be regarded as "consumer's overall assessment of the utility of a product (or service) based on perceptions of what is received and what is given" (Morar, 2013, p.171) and it is related to the value expected by the consumer. CPV is the notion that success of a product or service is largely based on whether customers believe it can satisfy their wants and needs (Kokemuller, 2019). Some have even argued that a customers' perceived value is the most important indicator of consumer repurchase intentions (Parasuraman and Grewal, 2000; Morar, 2013). CPV is a key concept in marketing management because repurchase intentions is closely related to customer loyalty. Increasing customer value will in the long-term benefit companies.

Zeithaml's (1998) definition differentiates what is received and what is given. The CPV formula represents this with total customer value (TCV) and total customer cost (TCC). TCV is the accumulated customer expectations when purchasing a product or a service, while TCC are the costs of obtaining, evaluating, searching and using a product or service (Morar, 2013; Selvi, 2007, p138). In order to

increase CPV, one would therefore have to either inc
decrease the customer costs. The CPV formula is represented as follows:

$$CPV = TCV - TCC$$

$$CPV = (Product\ Benefit + Service\ Benefit + Personal\ Benefit + Image\ Benefit) - (Monetary\ Cost + Time\ Cost + Energy\ Cost + Psychological\ Cost)$$

Product benefits are the benefits that are directly connected to the product or service itself. Service benefits are the services that are offered with the purchase of a product/service, like for example customer care. Personal benefits are the additional benefits that one would receive by investing in a product, such as buying a sustainable product. Image benefit can be referred as the satisfaction one would get for buying a product from a company that has the brand image that the individual is interested in sharing to others. Monetary cost is the physical price one has to pay for the product/service. Time cost is the time invested in researching or purchasing a product/service. Energy cost refers to the energy used by the customer for looking for or buying the product. Psychological cost is the mental effort and exertion one would suffer for buying and using the product.

2.7 How blockchain is related to the identified concepts.

This section of the paper is reserved for creating connections with blockchain and the other concepts that have been identified above. This, so we can better elaborate the hypothesis that will help to solve the research questions.

Blockchain, a solution to the Market for lemons problem?

Relating this to blockchain technology, as it will be able to offer transparency and traceability over the production of goods, information asymmetry between buyer and seller will decrease. They will have access to all information about a product, meaning that one will be able to backlog the products´ entire history. Also, using used cars as an example, one will be able to access the history of that car, what accidents it has been in, the reparations and changes it has gone through and how many owners it has had. Therefore, one will be able to differentiate a lemon from a high-quality car, diminishing the dishonest behavior of some sellers. Trust in the seller and the information provided will be replaced with the use of an application that enables individuals to access cars' histories, and other products. "Blockchain

technology promises to automatize the tracking of ca
and provide reliable information at any point in time it is needed" (Zavolokina et. al., 2019, p.1844). Sellers who have a car that has been well maintained, been in zero or very few accidents and that has had very few owners will benefit from this, by showing the buyers that the car they sell is of good quality. Hence, they will have the possibility to ask for a better price than they would if they would not have the possibility to offer the entire life-log of their car.

While BCT is able to offer a good solution, there already are existing actors on the market that offer the entire history log of cars. A vehicle history report (VHR) makes it possible to access information such as ownership and the total amount of repairs a car has gone through. Carfax is such a company, providing information about vehicles such as "model year, odometer readings, ownership records, accidents information, the existence of salvage and/or floor titles and maintenance records" (Hecklinger, 2006, p.1). However, Carfax is not a free service, which is one of its negative aspects, and finding a company that offers this service for free is not usual. Also, the only actors who are allowed to publish such information are insurance companies, local dealerships and similar. Finding information from only one source, where the data provider holds control over which information can be published, and also where the quality of data is low because of incompleteness and incorrectness is also a negative aspect with Carfax and similar systems (Zavolokina et.al., 2020). On the other hand, BCT can allow both public and private organizations to publish information on the platform. Indeed, Zavolokina et. al. (2020, p.1) has already tested for experience goods whether information asymmetry can be solved with the use of BCT, where the aim is to "manage to store and exchange the complete information about the life cycle of a car, from production to disposal". The mission is to try to reduce information asymmetry and increase trust between buyer and seller.

While BCT is good at providing adequate information, the consumer still has to assess the information given to them. Allowing both public and private organizations publish information will mean that individuals will have to use more time in assessing all the information that is being provided. However, assuming that the BCT is permissioned, where members are known, there will be more available information than the one that exists on Carfax, because several

people will be able to add information. According to Hansen & Schrader (2006), increasing market transparency can help to reduce information asymmetries. BCT is able to offer such a solution, but a problem that arises is how one can improve trust, since reducing information asymmetry is not enough to increase trust between buyer and seller. In their study, Zavolokina et. al (2020), trust is being controlled by reputation. Indeed, reputation mechanisms have been able to successfully improve trust (Füller, Serva & Benamati, 2007). By doing so, sellers who are selling low-quality cars are offered lower prices, and sellers who have a good reputation have the possibility to better their revenues because consumers are potentially willing to pay more for security and comfort of their services (Resnick, Kuwabare, Zeckhauser & Friedman 2000).

Even though BCT can help to reduce information asymmetry, Zavolokina et. al. (2020) found in their study that the quality of the data inserted in the system needs to be reflected by a third-party human actor. Hence, BCT will act as a mediator and trustee to build up trust in the system itself. Also, Mocan (2007) found that consumers do not utilize all information given to them when they assess quality. However, to reduce efforts in evaluating information, they use ques from their surroundings to assess quality. In other words, BCT could help to reduce information asymmetry in the market of used car for example, but there are other sources of information that can help to cloud the consumers' judgements.

Information asymmetry is present in all three SEC goods. Following, we will relate both blockchain and the SEC framework, to understand how the usage of blockchain on search, experience or credence goods differs.

Blockchain and Search, Experience and Credence goods

There are four different architectures to the usage of blockchain. Since search, experience and credence goods are different types of goods, there is reason to believe that they will have different usage of BCT. Hence, utilizing different blockchain architectures. It is also important to point out that BCT is still in the exploratory phase, meaning that there is much uncertainty surrounding it. Therefore, it is at this time not possible to be certain what architecture option companies will in fact use if they choose to decide to adopt BCT. The technology utilizes the concept of distributed consensus; therefore, all the concerned parties

are able to acquire the entire history of the product. T
selected and given rights to add and validate information available on the blocks, or everybody have the right to add and validate information depending on if they belong to the block.

According to Chang et. al. (2018), credence and experience goods benefit from the application of BCT. In addition, they also noted that it may not prove beneficial to leverage BCT for search goods. First, for credence goods, we know that the value of the product would still not be understood even after acquiring or consuming it (Animesh et.al., 2005). Giannakas (2005) underlines the fact that mislabeling in organic food markets has been neglected for credence goods in general. Indeed, it is hard to differentiate conventional food from organic food, as both can look and feel the same. Therefore, it is hard to distinguish mislabeled conventional products to organic ones. In addition, it is important to mention that the price of organic food is higher than that of conventional food (Zanoli & Naspetti, 2002). In other words, consumer's willingness to pay for organic food is higher than conventional food. Giannakas (2005, p.2) found that "consumer deception through mislabeling affects consumer trust in the labeling process and can have detrimental consequences for the market acceptance of organic products". This increasing phenomenon would lead to the failure of the organic food market. The usage of BCT in this sector would help to decrease or potentially eradicate mislabeling of conventional foods as organic, hence increasing consumer's trust in the labeling process. The consumer would also have access to information such as how organic the food is, as there are different levels in how organic a product is.

For search goods, the authors of this thesis have decided to use groceries as an example. The buyer has the choice between two types of pasta from two different brands. Assuming that both brands have incorporated blockchain to their products and have shared all of their data, the buyer will get ahold of the entire history log of the products. This will then be everything from the origin of the ingredients, all the way to the shipping of the products to stores. The buyer, who is for example pro-sustainability, will then know which brand is more sustainable, giving him/her information needed to make a choice. In the actual blockchain where one can find this information, consumers will not be able to add information to that specific

block. This because companies are the only ones pos
meaning that they are the only ones that can distribute it. However, there can be other blocks created as a forum, where any individual can post about the products.

For experience goods, used cars are a great example for this type of goods, as it can be compared to other technologies providing some of the same types of services as blockchain will. Just like cars registered on Carfax, if a vehicle is registered on a site using BCT, one can get ahold of the entire history log of the car. This would be information about collisions, yearly services, repairs, number of owners, etc. Presently, the seller is the only person possessing accurate information about the car´s history (depending on if he/she is the first owner). This means that the seller can manipulate the buyer's willingness to pay by controlling what information the buyer knows. Limiting important information such as how many collisions the car has been in can increase the buyer's willingness to pay. Therefore, having the buyer access such valuable information will affect the offer given to the seller. This behavior produced by sellers is called "opportunistic behavior", which was defined by Williamson (1985) as "self-interest seeking with guile", meaning that the seller attempts to scam the buyer by withholding information to secure a higher price (Ba & Pavlou, 2016, p. 3).

Blockchain technology and Customer Perceived Value

Following, BCT will have an effect on the search cost of consumers. Assumptions can already be made, where it is believed that BCT will affect customer benefit and customer cost. First, BCT can lead to an increase in customer benefit through some of the dimensions inside this benefit side. While it is uncertain how and which benefits will be affected, there is more certainty surrounding the fact that customer costs will be affected. In addition, there is more interest concerning search cost for this thesis, which has been related to customer cost from the CPV formula. Therefore, more attention will be given to this aspect.

First, offering a new service for customers will have financial costs for a company. It is unusual to offer a costly service to their customers for free, which is why it is believed that companies offering such a service will claim a fee from

their customers. Indeed, consumers are willing to pay
comfort for their services (Resnick et. al 2000). Since BCT offers security and comfort, in a sense that consumers are able to attain information that would otherwise be withhold, giving them the comfort that they know what they are buying, consumers would be willing to pay for such a service.

Second, time cost will be affected, but there may be variations in the findings. For reasons being that consumers have two choices when it comes to information seeking. For simplicity purposes, either consumers do not do any research pre-purchase, which can lead to them not utilizing BCT as a service when it is being offered to them. Time cost will therefore not be affected for these people. Or, they are people that typically do a lot of research pre-purchase, which means that since BCT is a more secure and reliable means to collect information, consumers would feel more secure in only collecting information from a BCT driven platform, where everything about a product can be acquired from one block. Time cost for these people would therefore be reduced. Also, another behavior can be produced, where if consumers that normally do not do any research get offered such a service, they may want to use it because it is interesting to see with what means a product is produced and how it is being transported. Time cost for them would be increased. The same type of pattern can be found with energy cost. This, because using energy on something leads to using time on that same thing, and vice-versa.

Finally, psychological cost will be affected in a way that this technology is new. Learning how to use new technologies puts a strain on people psychologically, in a sense that it takes time and effort to understand new technologies. The amount of psychological effort depends on how comfortable and quick consumers are with new technologies.

Blockchain technology, Search cost and Credence goods

Furthermore, the amount of search cost one performs in the three categories (SEC) is different, where "consumers would perceive an incrementally increasing degree of risk from search to experience to credence products" (Girard & Dion, 2010, p.1080). Effort into obtaining information in these three categories varies, as there are different levels of importance concerning the information that is needed for

buying a product. Chang et. al (2018) stated that exp
would benefit from the use of the technology.

For credence goods, there is uncertainty about how search cost will be affected. Getting ahold of information that will become available on BCT based platforms can change a buyer's willingness to pay as well as giving them the assurance that the product they intend on buying is as wanted. For this part, we will be using organic food as an example. Today, it is difficult to know whether an organic product is in fact organic. Consumers have to trust the seller to provide accurate information and label their products correctly. However, there have been some cases where conventional food has been sold as organic (Glebova et.al., 2019), where it enables sellers to increase margins because organic products tend to be more expensive (Hill & Lynchehaun, 2002). Hence, by acquiring such information, consumers will know that the organic product they intended to buy is a conventional product instead.

Moreover, assuming that a consumer normally does not use any effort into gathering information about the organic product they intend to buy, their time and energy cost will increase. However, if it was the other way around, namely consumers that typically do a lot of research, both energy and time cost will decrease. The reason being that collecting information such as this is in most cases hard or next to impossible (Mitra et. al., 1999). Hence, providing consumers with a reliable source of information gathering, where trust is higher in this technology than any other source for information gathering, would decrease energy and time cost. Therefore, it also depends on how the consumers gather information. In addition, psychological cost will be affected in an increasing manner, because someone will need to adapt to the usage of such a technology.

Blockchain technology and perceived risk

Consumers experience a certain amount of risk, during and after a purchase. As stated before, for the sake of this thesis, there are 6 different types of risk defined which are assembled into one overall risk. Girard & Dion (2010) argued that consumers would experience an increasing amount of risk along search, experience and credence goods. Where search has the lowest amount of risk and credence as the highest. The reason being that it becomes more difficult to obtain

information before making a purchase from search to experience goods (Mitra et.al., 1999). Indeed, since both search and experience goods make it possible to see the product before purchasing them, the risk associated with these types of goods are lower than credence goods. In addition, it would make sense that experience goods have a higher risk than search goods, as it has to be experienced before knowing its' true value. In general, in order to decrease the risk that customers perceive when faced in front of a purchase, additional information needs to be gathered (Crocker 1986; Davis, Guiltinan & Jones, 1979). This can be either collecting information from personal or impersonal sources. The higher the risk, the more personal and impersonal information needs to be gathered. Indeed, Mitra et.al. (1999) found that for credence goods, consumers attempt to gather information more from personal and impersonal sources. Certainly, since the risk is higher for credence goods, consumers need to gather more information, which is why they try to collect information from all the available sources.

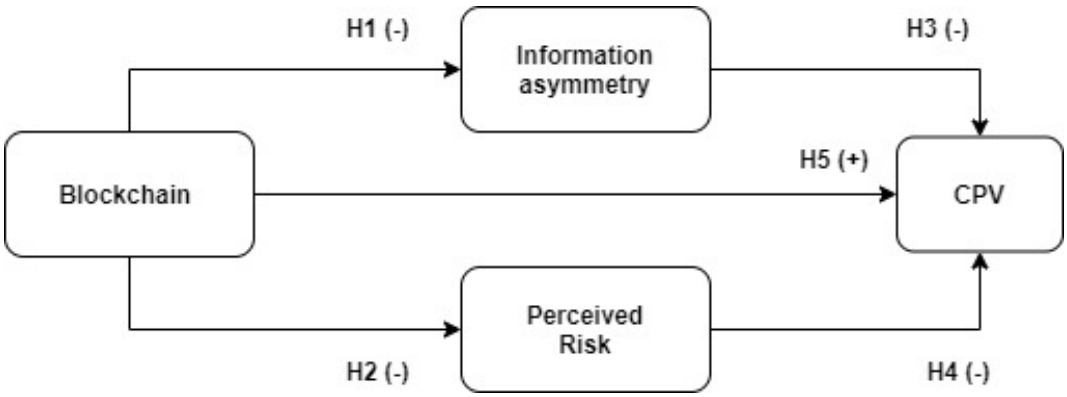
BCT is a means to store and gather information. Given how BCT as a technology works, where information needs to be validated by all the its' nodes (people belonging to the network), it is a good way to collect reliable information. In other words, it decreases the possibility that incorrect information is being published thanks to its' validation procedure. Meaning that since BCT is a way to secure reliable information for its users, it is a means to reduce the risk that customers experience pre-purchase. In addition, information that would otherwise be unavailable for the end consumer will be available on a BCT platform. This, because of the technology's two characteristics, transparency and traceability.

3.0 Hypothesis

Following, we will provide the research model u
followed by the hypothesis themselves.

The goal of this study was to closer investigate whether firms, through the adoption of blockchain technology, could increase customers' perceived value within the credence goods category. Also, whether BCT could help solve what Akerlof (1970) described as the market for lemons problem. In the early stages of the study it was expected to be an exploratory design. However, during the literature review we were able to see an empirical fit between blockchains' characteristics, the concept of value, information asymmetry and perceived risk. We found reasons to believe that the effect between BCT and CPV would become stronger through information asymmetry and perceived risk. Making it possible to create a descriptive model to investigate instead.

Further, a proposition of our research model has been illustrated in model 2. We are using BCT and its' contribution as independent variable, CPV as dependent variable, and perceived risk and information asymmetry as mediators. We are looking at the direct effect and indirect effect through the mediators; information asymmetry and perceived risk.



***Model 2**: Research Model*

The authors of the thesis will use traceability, tamperproof and transparency as the main characteristics of BCT. While six were identified in the literature review, it was decided that tamperproof is a good way to round up security, immutability

and confidentiality into one characteristic. In addition
is ignored, as it is more valuable in a B2B contex...

The characteristics make it possible for buyers to better assess information and evaluate a product or service. In other words, it leads to the reduction of information asymmetry, as Zavolokina et.al. (2019) demonstrated in their study for experience goods. First, traceability benefits the buyers in a way that they will be able to have access to a products' life cycle through the supply chain. This is a crucial characteristic, because it enables consumers to know if the organic vegetables that they are buying are in fact organic. Consumers will be able to trace back the product to its' source of origin.

The second characteristic, tamperproof, gives consumers a better sense of trust in the information being provided, as they are less concerned whether information is manipulated or tampered with. Therefore, they will be more assertive of the fact that information asymmetry between seller and buyer is reduced.

Lastly, transparency signifies that no information is withhold from consumers. Companies working with a BCT based platform will be transparent in the way they conduct business, in a sense that they will share the knowledge that they have. Consumers will therefore have access to more information, making it easier and better to evaluate a product. Comparing both conventional and organic products, it is hard to tell the difference between these before or even after consuming them. What differentiates both is how they are produced. This is what type of information a seller knows and might consciously withhold. Hence, BCT will help consumers to access such information, where they will know with a better certainty that the organic vegetables they are buying are in fact organic. Hence, the first hypothesis is given:

H1: Blockchain technology reduces information asymmetry.

Consumers, when being faced with a purchase experience certain risk. By only looking at an organic vegetable, which is a credence good, one cannot differentiate it from a non-organic one even after consuming it. Today, one can find out if a vegetable is organic by looking for organically stamped products.

However, this can be manipulated from sellers, wher
products are actually non-organic (Glebova et.al., 2019). Buyers can try to get ahold of information from sellers that gives them the assurance that a vegetable is organic. However, this information is hard or next to impossible to obtain. Therefore, since information is limited, the risk of making a bad purchase is high, especially because it is hard to differentiate conventional vegetables from organic vegetables.

Indeed, consumers try to reduce perceived risk by acquiring and assessing information (Taylor, 1974). BCT is a means to collect information, and especially information that one can trust more thanks to its' characteristics. Also, it is information that would otherwise be intentionally unavailable for consumers. This means that consumers will be able to direct less time into information searching, in a way that they do not need to search for the same type of information with other sources, as information found through BCT is more reliable. BCT itself does not make it more reliable (Lemieux, 2016), but information contained in the blocks needs to be validated by all its nodes, which reduces the risk of publishing fraudulent information. Hence, the risk of making a bad purchase decreases if one can find information about a product using BCT, where there are credible nodes. Therefore, the following hypothesis has been formulated:

H2: Blockchain technology reduces customer's perceived risk.

Akerlof (1970) described in his article the market for lemons problem, specifying the existence of information asymmetry between seller and buyer. Where there is presence of information asymmetry, customers may end up purchasing a product or service that does not fit their needs. In other words, the perceived value of the product or service will be reduced. Provided that consumers are able to access such information, it will give them an increasing benefit. Hence, increasing CPV. In addition, the type of behavior one can notice in consumers pre-purchase, is that they collect information. Therefore, this potentially will lead them to the increase in search cost, which leads to lower CPV. Hence, the third hypothesis is given:

H3: Information asymmetry reduces customers' perceived value.

Zeithaml (1998) defined two dimensions of CPV, co

In addition, as it has been stated before, consumers will seek to reduce the risk of making a bad purchase through acquiring and assessing information. This means that consumers increase effort and time into obtaining enough information to reduce the risk at a satisfactory level. This effort and time is not only exerted pre-purchase but also post-purchase, as it may be that the bought products are defected or damaged, and therefore they need to be replaced. Having said that, this would mean that the cost dimension of CPV increases. Hence, the fourth hypothesis is put forth:

H4: Perceived risk reduces customer perceived value.

For this thesis, we focus on whether blockchain can create value was within the credence goods category. Today, there is no other technology that can deliver the same as BCT for this type of good. This means that entering the credence goods market with BCT will be unique. In other words, it will create value for the industry and the customers.

As of now, consumers perceive a high amount of risk within credence goods. In order to decrease this risk, consumers assemble as much information as possible from both personal and impersonal sources (Mitra et.al. 1999). By doing so, they are using a lot of time and effort into collecting and assessing the information. Also, it is important to note that information searching within credence goods is difficult (Girard & Dion, 2010) as sellers are the only ones with the information that is of interest. As mentioned before, both time and energy are part of the cost side in CPV (Zeithaml 1988). Since BCT makes it possible to attain such knowledge, and it is believed to be a more trusting means to collect information. Therefore, for consumers using BCT to collect the desired information, they will notice a reduction in time and energy. Hence, a decrease on the cost side of CPV. Furthermore, there is uncertainty surrounding the fact that if a BCT based platform will be free to use, or a payed service. Hence, it will affect monetary cost for consumers, which in turn affects CPV. Further, the fifth hypothesis is given:

H5: Blockchain technology increases customer perceived value.

4.0 Methodology

The following section presents the research question for this study and elaborates on the research method that is going to be implemented. It describes the research approach, research design, how data has been gathered and how the data analysis was performed.

4.1 Quantitative research

The methodology used in this research is a quantitative approach. A quantitative approach is used for testing objective theories by examining the relationship among variables. This also allows for the variables to be measured so that numerical data can be analyzed (Creswell, 2014, p.4). Further, this study uses a descriptive design, where the aim is to describe the situation in a specific area and the authors have a basic understanding of the area of investigation (Gripsrud, Olsson & Silkoset, 2010). A deductive approach is also applied, where we use what is already known about the matter to deduce hypothesis to be researchable operationalized terms and entities (Bryman & Bell, 2015). Following, based on the hypothesis we can specify what kind of data that needs to be collected. An explanatory survey will be used where we want to answer "how" the independent variables formulated in the hypothesis correlate or behave with the dependent variables. Also, in terms of the analysis, we want to answer "why" results and implications will be, for explaining why the relationships are so (Williamson, 2002). By using a quantitative approach, it gives us the opportunity to investigate and say something about the direction of the effect BCT has on CPV, as well as the strengths of these effects. Using the right sampling technique allows us to generalize the results to a greater population. Therefore, we opted for a quantitative approach.

In order to collect the intended data, a survey was created, using Qualtrics as a supplier. Following, the data was downloaded to IBM SPSS statistics 26, which was then used to analyze the data and deliver results.

4.2 Cross-sectional design

The cross-sectional study is the most frequently used descriptive design in marketing research (Malhotra & Birks, 2006). This study uses a single cross-sectional (or sample survey research) design. This, because only one sample of

respondents was drawn, once, from the targeted popu
on the population characteristics at a specific point in time. Doing so makes it relatively inexpensive and efficient, which is suiting due to limited resources compared to a longitudinal design (Malhotra & Birks, 2006). This opens for bigger samples and enables to study the relationship and patterns between more than one variable at a time. However, because the data collection is done at only one point in time and give no indications of the sequence of events, external factors could affect respondents' answers which can be a challenge to infer causality- for example the fact that this study was performed in the middle of the corona pandemic (Levin, 2006).

In order to be able to infer causality, a causal design could be used, where each variable is isolated and where there is full control over internal factors. However, this would not be possible to implement due to limited resources. In addition, the theories that have been provided in the literature review is clear, where we should be able to find correlations between BCT and CPV, through the mediators perceived risk and information asymmetry. Following, this study does not meet all the requirements for using a causal design, as we cannot control for every variable (Malhotra & Birks, 2006).

4.3 Scales

All questions formulated in the survey were adopted and adapted from existing literature, except tamperproof, which is the product of security, confidentiality and immutability. Efficiency was excluded due to the nature of it being more relevant in a B2B context.

Multi-item measures were developed to measure the constructs. These were also adjusted in order to fit the research context- using organic vegetables to represent the credence goods category. All multi-item measures were based on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). All items, what construct they are measuring and where they are adopted from are reported in Table 1. The questions were adopted from English literature. Because our target population consist of Norwegians and the study was conducted in Norway, items were formulated in Norwegian and then translated back to English for the sake of this paper.

Self-esteem was included as control variable, because higher self-esteem in organic products are expected to correlate positive with CPV. People who are confident in their evaluation of green products are expected to see a higher benefit in these purchases (Mieres, Martin & Gutiérrez, 2006). Questions regarding descriptive statistics such as level of education, gender etc. was included to better describe the sample's demographics. The level of education can also be regarded as a control variable because, consumption of organic products is often correlated with a higher level of education (Shafie & Rennie, 2012).

Variable	**Items**	**Adapted from**
Transparency	I am certain that I can get access to all information about vegetables that are: -Relevant for my purchase -Important for my purchase -Crucial for my purchase -Meaningful for my purchase	*Yiannas (2018)*
Tamperproof	I completely trust that the information about vegetables never have been: -Manipulated -Tampered with -Cheated with -Falsified	-
Traceability	I completely trust in the traceability of vegetables: -Production methods -Expiration date -Geographic origin -Certification schemes -Transportation	*Choe et. Al. (2008) and Rijswijk et al. (2008)*
Information asymmetry	-Many organic vegetables are actually ordinary vegetables. -Many organic vegetables are actually non ordinary vegetables. -I am unsure if organic vegetables are really ordinary vegetables sold as organic. -I have to trust that organic vegetables are what they say they are, because there are no other ways in finding it out. -It is extremely difficult to know for sure if organic vegetables are what they claim to be.	*Heide & Miner (1992)*

	-It is difficult for me to know whether orga vegetables are in fact organic. -It is difficult for me to evaluate whether organic vegetables are in fact organic.	
Functional risk	I am unsure if organic vegetables: -Have different quality than ordinary vegetables. -Have different nutritional content than ordinary vegetables. -Will give a different result than ordinary vegetables. -Is more organic than ordinary vegetables.	*Mieres, Martín & Gutiérrez (2006)*
Financial risk	I am unsure if organic vegetables: -Gives more value for money than ordinary vegetables. -Is more a more reasonable way to spend money than ordinary vegetables. -Is a better purchase than ordinary vegetables. -Defends a higher price than ordinary vegetables.	*Mieres, Martín & Gutiérrez (2006)*
Social risk	I am concerned that purchase of organic vegetables: -Makes my family and friends to think more negatively about me than if I buy ordinary vegetables. -Makes others feel more negatively about me than if I buy ordinary vegetables. -Makes others to wrongly perceive me than if I buy ordinary vegetables. -Makes others to act more uppity towards me than if I buy ordinary vegetables.	*Mieres, Martín & Gutiérrez (2006)*
Physical risk	I am afraid that purchase of organic vegetables: -Is not safer for me or my family to consume than ordinary vegetables. -Does not have a better effect on my health than normal vegetables -Has the same health effects as ordinary vegetables -Can be just as harmful for me or my family as ordinary vegetables	*Mieres, Martín & Gutiérrez (2006)*
Psychological risk	By purchasing organic vegetables: -I feel uncomfortable because I think that they are similar to ordinary vegetables -I feel unsatisfied because I think that they are similar to ordinary vegetables. -I feel unsatisfied with how I appear because they are similar to ordinary vegetables.	*Mieres, Martín & Gutiérrez (2006)*

	-I feel more uncertain of myself because I t that they are not different from ordin vegetables.	
Time Risk	By purchasing organic vegetables: -It is a waste to use more time on assessing whether they are similar to ordinary vegetables -It is a bad use of time to assess whether they are exactly similar to ordinary vegetables -It is an unnecessary usage of time because they are exactly similar to ordinary vegetables -It is a waste of time because they are exactly like ordinary vegetables	*Roselius (1971)*
CPV	-Organic vegetables are valuables -Organic vegetables are worth what i pay for -I feel I get what I can paying for -The price is faire	*Chang & Wang (2011)*

Table 1: *Scales, Items, and where they are adapted from*

4.4 Survey development

The survey used to gather data in this study consists of two parts. For the first part, the questions are designed with a 5-point Likert-scale to cover the constructs. For the second part, questions related to demographics such as age, education, income and relationship are asked. The survey in its entirety can be found in the appendix (chapter 9.1).

To follow the Norwegian laws about GDPR, respondents are asked to give their consent before answering the survey. They are told that information collected about them will remain anonymous, where no individual can be identified from answering this questionnaire. Following, the first question is set so that information about how much in percent respondents consume organic vegetables weekly and where they purchase their vegetables. Next, respondents are asked to answer various statements covering our constructs, using a 5-point Likert scale, where 1 is strongly disagree and 5 is strongly agree. A descriptive text is provided before every new statement, where they are being provided with the context.

The second part of the study consists of descriptive statistics, which is useful to identify whether the sample could be representative in any way. By describing the sample, later similar studies can compare their results based on descriptive

statistics. The questions related to this were intention
the questionnaire, because if respondents do not want to answer such sensitive information, important data can still be collected from these, so that an analysis with their results can be used.

4.5 Pre-test

A pre-test was performed to make sure that the questions were clear and that the layout of the questionnaire was satisfactory (Hunt, Sparkman & Wilcox, 1982). Therefore, before publishing it, the survey was sent to friends and family. The respondents were asked to give their opinion on how hard it was to understand what was asked of them, as well as how much time they used to complete the survey. Their responses were collected, where common issues from the participants were identified and treated (Burns, 2016). One thing that was consistent in all the responses was the fact that many of the questions seemed similar. In order to keep validity, the questions remained unchanged. When the final survey was published, the respondents were warned that many of the questions seemed similar, but that they had to answer them in the best way possible.

4.6 Population and Sampling technique

The intended population for this study is Norwegians who intendedly consume organic vegetables. The data was gathered over the course of one week in June 2020. The sampling technique used is a sampling without replacement approach, meaning that once a respondent has answered the survey, they cannot retake the survey (Malhotra & Birks, 2006). A non-probability convenience sampling technique is when one does not use chance selection procedures to select a sample that is more convenient for the study (Malhotra & Birks, 2006).

The most convenient way to reach the intended population, namely Norwegians who consume organic vegetables, was to select and reach out to Facebook groups. Since there were no “organic vegetable” Facebook groups that were of a big enough size, vegetarian, vegan and self-cultivating groups were selected instead.

This because we figured that they had a higher intere
consumption than other people.

The administrators in one of the groups were asked if a survey could be published on their group, where it would stay for one week. In addition, they were asked if they could pin the survey so that it would remain on the front page, in order to get as many respondents as possible. This group consisted of approximately 29.000 members at that time. The other groups were merely asked if it was possible to publish the survey on their group.

Nonresponse is a common problem in wide-scales surveys. Therefore, to collect as many responses as possible, it was specified on the posts that two respondents who commented “completed” upon finishing the survey would be selected to choose a prize (Levin, 2006). This would either be a transfer of 100 NOK to their bank account, or four scratch cards sent in the post. As there is an age limit on the scratch cards, if the lucky winner was under 18 years, they could not choose this option. By using this sampling method, we ended up with 380 usable responses to be used in our analysis.

5.0 Results

In this section, we will identify and collect the results from the data collection. These will further be used for discussion purposes.

5.1 Descriptive statistics

A total of 484 responses were collected. However, some respondents did not finish the survey (104 respondents), which resulted in 380 usable responses. Further, an overview of the descriptive statistics is given.

Age	Frequency	Percent	Mean
15-25	104	27.37	-
26-40	139	36.58	-
41-55	95	25.00	-
55+	42	11.05	-
Total	**380**	**100.00**	**36.44**

Table 2: *Descriptive statistics Age.*

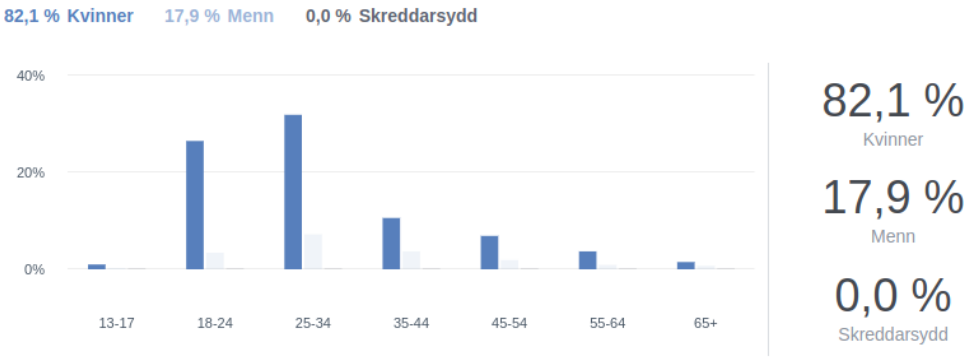


Figure 1: Gender and age distribution of Veggietalk

Table 2 shows the age distribution as well as the age mean of the total data distribution, where the age ranges from 15 to 76 years. The average age of the respondents is 36.44. The statistics show that 27.37% of the total respondents are between 15 and 25 years, 36.58% are between 26 and 40 years, 25.00% are between 41 and 55 years, and 11.05% were 55 years and older. This is not surprising, as approximately 36% of the members of the Veggietalk group are between 25-34 (Figure 1).

	Frequen	
Female		
Male	31	8.20
Other/ do not wish to answer	10	2.60
Total	380	100.0

Table 3: *Descriptive statistics Gender*

Table 3 shows the gender distribution in the total data set. Female accounted for 89.20% of the total respondents (339), and 8.20% were male (31). This result is not surprising, as the Facebook group that we collected most respondents from (Veggietalk) contains 82.10% female (kvinner) and 17.9 % male (menn) (Figure 1). Also, the group has more than 28.700 total members at the time of data collection (from Facebook page).

	N	Minimum	Maximum	Mean
Local %	380	.00	100.00	7.93
Regular grocery stores%	380	.00	100.00	88.66
Online grocery stores %	380	.00	100.00	2.99
Total vegetables consumption %	380	.00	100.00	33.69

Table 4: *Descriptive statistics organic vegetables consumption and buying location*

Table 4 gives an overview of the respondents' buying habits regarding organic vegetables, as well as their total vegetable consumption. Of the total vegetables purchased, 88.66% purchased at regular grocery stores, 7.93% purchased at local stores such as farmers market and similar, and 2.99% was purchased online. In addition, the data indicates that 33.69% of the total amount of vegetables the respondents purchase are organic. These results show that our sampling technique was somewhat successful in reaching out to people who have history in purchasing organic vegetables.

	Frequency	
Primary school	13	
High school	131	34.50
Bachelor (3 years)	136	35.80
Master (5 years)	94	24.70
Phd	4	1.10
Total	380	100.00

Table 5: *Descriptive statistics Education*

Table 5 shows descriptive statistics of the sample's education level. Both respondents with a bachelor (35.80%) and master (24.70%) amounts to 70.50% of the total sample size. Those with a high school degree amount to 34.50%. Finally, those with a primary school degree (3.40%) and PhD (1.10%) amount to a total of 4.50% of the total sample size.

Previous studies have shown that consumers with the highest level of education are the most willing to purchase organic products (Dettmann & Dimitri, 2010; Zepeda & Li, 2007; Krystallis, Fotopoulos & Zotos 2006; O'Donovan & McCarthy, 2002; Cicia, Del Giudice & Scarpa 2002; Fotopoulos & Krystallis, 2002; Magnusson, Arvola & Hursti 2001). However, our research shows that total organic food consumption is the highest with consumers with a high school degree (Figure 2). Since this does not align with previous research, it can be that our sampling technique is not optimal.

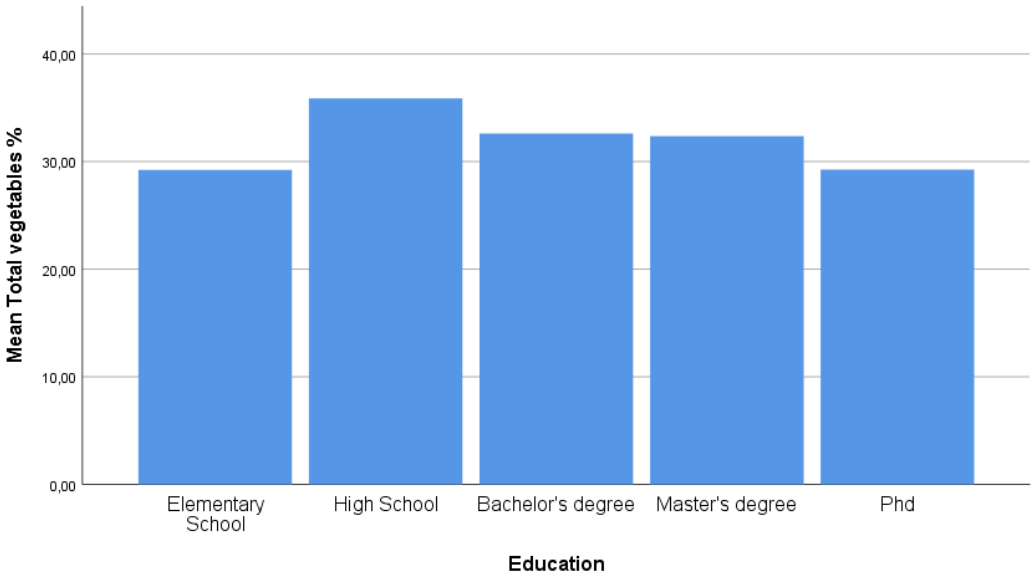


Figure 2: Mean total organic vegetable purchase shown by education

We see some variations in whether the respondents v
different technologies and certification schemes. As expected, the respondents had the least knowledge about RFID and BCT. For RFID, 58.68% of the respondents reported "strongly disagree" to whether they knew about the technology. Also, for BCT, 57.36% reported "strongly disagree" (Table 7).

Moreover, according to Table 6, respondents were more familiar with these two technologies, with certification schemes as being the most known. For the certification schemes, the majority reported either 4 or 5, which accumulates to 41.31%. In addition, for QR-codes, it was more divided compared to RFID and BCT, but still the majority responded between 1 and 2 (58.67%). Therefore, we can say that not many are aware of the existing technologies.

Certification schemes	Frequency	Percent	QR-codes	Frequency	Percent
1 (strongly disagree)	74	19.47	**1 (strongly disagree)**	126	33.15
2	66	17.36	**2**	97	25.52
3 (neither or)	83	21.84	**3 (neither or)**	97	25.52
4	105	27.63	**4**	46	12.10
5 (strongly agree)	52	13.68	**5 (strongly agree)**	14	3.68
N	**380**	**100.00**	**N**	**380**	**100.00**

Table 6: *Respondents familiarity with Certification schemes and QR-codes*

RFID tech.	Frequency	Percent	BCT	Frequency	Percent
1 (strongly disagree)	223	58.68	**1 (strongly disagree)**	218	57.36
2	58	15.26	**2**	61	16.05
3 (neither or)	79	20.79	**3 (neither or)**	83	21.84
4	11	2.89	**4**	10	2.63
5 (strongly agree)	9	2.36	**5 (strongly agree)**	8	2.10
N	**380**	**100.00**	**N**	**380**	**100.00**

Table 7: *Respondents familiarity with RFID technology and Blockchain technology*

5.2 Kurtosis skewness and normal distribution

To see whether the items fit into a normal distribution we assessed kurtosis and skewness.

Skewness is a measure of asymmetry, where the skew value of a normal distribution is zero, implying that the distribution is symmetric. Also, positive skew values indicate that the right-side tail is longer than the left side tail and that the bulks of the values lie to the left of the mean, and vice-versa (Kim, 2013). West, Finch & Curran (1995) proposed a reference of substantial departure from normality to be an absolute skew value of 2.

Furthermore, kurtosis is a measure of "peakedness" o
peak is. The kurtosis value provided by SPSS is an excess kurtosis, which is what you get when subtracting 3 from the original kurtosis (also called kurtosis (proper)). West et al. (1995) suggested a kurtosis (proper) > 7 to be acceptable. This means that 3 must be added to get the kurtosis proper.

Variable	N	Skeweness	Kurtosis	Missing
BCT	380	-.04	-.38	0
CPV	376	-.30	-.62	4
Information asymmetry	380	-.13	-.57	2
Percieved risk	380	.38	-.64	5

Table 8: *Normal distribution, Skewness and Kurtosis*

From Table 8, which reports the normal distribution, skewness and kurtosis, we see that the skewed values for BCT, CPV and information asymmetry are negative. Also, we notice perceived risk is positive. Therefore, we can deduce that the data for perceived is right-skewed, while the data for BCT, CPV and information asymmetry is left skewed. We also notice that all skewed and Kurtosis values are in the acceptable range, below 7 (when adding 3 to the excess kurtosis).

5.3 Validity and reliability

Construct validity evaluates whether a measurement tool represents what is being measured- whether the chosen measures to fit are able to capture the construct (Middleton, 2019). In other words, it is to control whether the included variables accurately compute the constructs they are intended to measure. Bryant, Yarnold & Michelson (1999) considered factor analysis to be the preferred method to assess validity for self-reporting questionnaires and is a multivariate statistical procedure for multiple purposes (Williams, Onsman & Brown, 2010). Exploratory factor analysis has traditionally been used to explore the possible underlying structure of a set of interrelated variables without imposing any preconceived structure of the outcome (Suhr, 2006, p. 2; Child, 1990). Suhr (2006, p. 1) further states that a confirmatory factor analysis should be assessed when the researcher used theory, empirical research, or both. Harrington (2009) further states that a confirmatory factor analysis measures the scales' reliability and not validity because the factor analysis is used to control whether the items fit together.

Therefore, a confirmatory factor analysis will be asse
for variables supposedly measuring the same construct.

To evaluate the validity, we assess the Kaiser-Meyer-Olkin (KMO) statistics, Bartlett's test of sphericity, the component matrix and eigenvalues. KMO gives an indication on how interpretable the final factor pattern matrix is. Also, it measures tendency of unifactoriality for a given row and the entire pattern matrix. Even though this will not be used much, it is relevant to assess it as it gives indications to whether the selected variables should be divided into different factors. Also, it could affect the analysis later. Kaiser (1974) recommended a value of .7 or higher for a factor analysis to be relevant. Also, Tabachnick, Fidell & Ullman (2007) adds that the Bartlett's test of sphericity should be significant ($p < .05$) for a factor analysis to be suitable.

	BCT	**Perceived risk**	**Information asymmetry**	**CPV**
KMO	.90	.92	.83	.80
Bartlett's test of Sphericity (Sig.)	.00**	.00**	.00**	.00**
**. Bartlett's test is significant at the 0.01 level.				

Table 9: KMO and Bartlett's test of Sphericity for all constructs

BCT	**1**	**2**	**3**	**4**	**5**	**6**
Eigenvalue	6.22**	2.12**	1.28**	.71	-	-
% of Variance	47.86	16.33	9.84	5.45	-	-
Information asymmetry	**1**	**2**	**3**	**4**	**5**	**6**
Eigenvalue	3.58**	1.14**	.84	.54	-	-
% of Variance	51.10	16.30	12.00	7.77	-	-
Perceived risk	**1**	**2**	**3**	**4**	**5**	**6**
Eigenvalue	10.63**	3.34**	2.35**	1.29**	1.13**	1.03**
% of Variance	44.30	13.92	9.81	5.38	4.72	4.28
CPV	**1**	**2**	**3**	**4**	**5**	**6**
Eigenvalues	3.06**	.56	.24	.13	-	-
% of variance	76.47	14.10	6.07	3.36	-	-
**. Eigenvalues > 1.						

Table 10: *Component variance and eigenvalues explained for the constructs*

In order to evaluate the discriminant validity, correlations will be analyzed. Trochim & Donnelly (2001) stated that discriminant validity is a supporting evidence for construct validity. Also, the idea behind discriminant validity is that

measures that should not be related are in fact, not re

Pearson correlations between the constructs. We notice that all constructs are significantly correlated, which indicates a low discriminant validity. This may be caused by our sampling technique but could also be a result of the constructs being correlated. As discussed in the literature review, there are indications that for example high information asymmetry and high perceived risk leads to lower CPV, which can be backed up by the negative correlations between the constructs.

		Info_asym	CPV	Percieved_risk	BCT
Info_asym	**Pearson Correlation**	1	-,29***	,46***	-,41***
CPV	**Pearson Correlation**	-,29***	1	-,57***	,19***
Percieved_risk	**Pearson Correlation**	,46***	-,57***	1	-,20***
BCT	**Pearson Correlation**	-,41***	,19***	-,20***	1
***. Correlation is significant at the 0.01 level (2-tailed).					

Table 11: *Correlations between constructs*

Reliability is related to the consistency of a measure (Heale & Twycross, 2015, p. 6). In other words, the extent in which the scales are consistent and able to reproduce the same solutions. The most typical measure for internal consistency (or homogeneity) is Cronbach's Alpha. It tests the average correlations in every combinations of split-halves (correlations calculated by splitting the results of a test or instrument in two, then calculate correlations based on both halves) and can be used on instruments with questions having more than two responses (Heale & Twycross, 2015, p. 7). Cronbach's Alpha results in a number between 0 and 1, and should be larger than .7, where values close to 1 indicate high internal consistency (Heale & Twycross,2015; Gripsrud, Olsson & Silkoset, 2010). However, Malhotra & Birks (2006) stated the threshold to be .6. The authors of this thesis are using .7 as the critical value. Each construct's Cronbach's Alpha and their number of items are shown in Table 12.

	BCT	Perceived risk	Information asymmetry	CPV
Cronbach's Alpha	.91	.94	.83	.90
N of items	13	24	7	4

Table 12: *Cronbach´s Alpha for BCT, Perceived Risk, Information Asymmetry and CPV*

Most of the items included in the survey are adopted

These variables are supposed to cover a set of constructs. However, the sampling technique used in this thesis may have caused the data to deviate from previous research, by using these constructs. In other words, it could not be ideal to run an exploratory factor analysis. Instead, 4 independent factor analysis will be conducted for the concepts, where only one factor will be specified because it is still relevant to see whether the variables load high on the construct factor, or if it should be removed. Sørebø (2003) argued to use a factor loading of .3 as a threshold for including a variable in a factor.

Blockchain characteristics

Table 9 shows KMO statistics and Bartlett's test of the BCT characteristics. The results are significant (KMO > 0.7, $p < 0.05$), meaning that an implementation of a factor analysis would be relevant. Looking at the eigenvalues for BCT from Table 10, it suggests 3 factors (eigenvalue > 1). In addition, factor 1 explains 47.86% of the variation. Indeed, this was expected, as there are three identified characteristics of BCT.

	Compone
Traceability 1	,[illegible]
Traceability 2	,36
Traceability 3	,61
Traceability 4	,60
Traceability 5	,69
Tamperproof 1	,75
Tamperproof 2	,76
Tamperproof 3	,79
Tamperproof 4	,77
Transparency 1	,71
Transparency 2	,77
Transparency 3	,73
Transparency 4	,70
Extraction Method: Principal Component Analysis.	

Table 13: *Factor loadings for BCT*

Table 13 shows that all variables load high on factor one, except "traceability 2" having a factor loading of .36 on factor two, implying that it is not low enough for being removed. In addition, the variables are able to explain 91.00% of the variation in BCT indicating a high internal consistency (Table 12).

Because the factor analysis suggests three factors (Table 10), three factors will be created to be used in regressions for discussion purposes (Appendix, 9.2).

Information asymmetry

The KMO and Bartlett's test of sphericity indicates that the variables regarding information asymmetry consists of more than one factor (KMO > 0.7, $p < 0.05$), which is unexpected considering information asymmetry is one dimensional (Table 9). Looking at the eigenvalues for information asymmetry from Table 10, it suggests 2 factors (eigenvalue > 1). In addition, factor 1 explains 51.10% of the variation. Also, the eigenvalue for the second factor is fairly low (1.14).

	Com
Information asymmetry 1	,78
Information asymmetry 2	,69
Information asymmetry 3	,71
Information asymmetry 4	,50
Information asymmetry 5	,88
Information asymmetry 6	,87
Information asymmetry 7	,81
Extraction Method: Principal Component Analysis.	

Table 14: *Factor loading for Information asymmetry*

All variables load high on one factor, indicating a high internal consistency (Table 14). The component matrix suggests that both information asymmetry questions 1 and 4 should be in another factor, because factor loadings for these two variables are lower than the others. Following, the factor explains 83.00% of the variation in the phenomenon. Indeed, the internal consistency was expected to be lower for this factor, because 2/7 variables could be attributed to another factor. However, the Cronbach's alpha is .83, which is above the threshold of .7 (Table 12).

Perceived risk

According to Table 9, KMO and Bartlett's test suggests that these variables consists of more than one factor (KMO > 0.7 and $p < 0.05$). Out of all the four constructs, this was most expected due to the fact that the construct consists of six dimensions. This concepts' KMO value is the highest of them all, and it suggests six factors (eigenvalue > 1) (Table 10), where factor 1 explains 44.30% of the variation.

	Compon
Functional Risk 1	
Functional Risk 2	,62
Functional Risk 3	,65
Functional Risk 4	,63
Financial Risk 1	,64
Financial Risk 2	,68
Financial Risk 3	,69
Financial Risk 4	,61
Social Risk 1	,35
Social Risk 2	,37
Social Risk 3	,37
Social Risk 4	,35
Physical Risk 1	,70
Physical Risk 2	,77
Physical Risk 3	,69
Physical Risk 4	,66
Psychological 1	,72
Psychological 2	,75
Psychological 3	,69
Psychological 4	,72
Time Risk 1	,79
Time Risk 2	,81
Time Risk 3	,82
Time Risk 4	,84
Extraction Method: Principal Component Analysis.	

Table 15: *Factor loadings for Perceived Risk*

The component matrix indicates a high convergent validity with all factor loadings above .61, except variables connected to Social risk, with factors loadings between .35 and .37 (Table 15). However, they are still above the threshold of .3, meaning that we can keep these variables. The factor is able to explain 94.00% of the variation in perceived risk which indicates a very high internal consistency (Table 12).

Customer Perceived Value

According to Table 9, even with a significant Bartlett's test ($p < 0.05$) and a KMO value of .80, the eigenvalues suggest only one factor, which is expected with only four items (eigenvalue > 1). Factor one is responsible for 76.47% of the variation

and all factor loadings are above .79, indicating a hig
10 and 16). The CPV factor explains 90.00% of the variation in CPV, indicating a high internal consistency (Table 12).

	Component
CPV 1	,79
CPV 2	,94
CPV 3	,94
CPV 4	,83
Extraction Method: Principal Component Analysis.	

Table 16: *Factor loadings for Customer's Perceived Value*

These results from the reliability and validity tests are at a satisfactory level. Therefore, the intended variables will be used for the regression analysis.

5.5 Sobel's test for mediation

The optimal solution would be to test the research model using an equation system. However, because SPSS does not support equation systems, both perceive risk and information asymmetry are going to be tested to see if they truly are mediators, so that the strength of the effects can be analyzed further.

A given variable may be said to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion (Baron & Kenny, 1986). Baron & Kenny (1986, p.1176) introduced 3 crucial conditions for being considered as a mediator. "(a) the independent variable must significantly account for the variation in the mediator, (b) variation in the dependent variable must significantly account for the variation in the mediator, and (c) a previously significant relation between the independent and depend variable should no longer be significant when (a) and (b) is controlled for". To test whether there is a mediation effect or not, they suggested using Sobel's test. The test provides an approximate significance test for indirect effect of the independent variable on the dependent variable via the mediator (Baron & Kenny, 1986; Sobel, 1982).

To utilize the Sobel's test, an online calculator was used, developed by Preacher and Leonardelli (Sobel test, 2001). Here, the beta coefficient for the BCT

characteristics was used as (a) and standard deviation
independent variable and the mediator as the dependent variable) (Table 21). Also, the beta coefficient for the mediator was used for (b) and the standard deviation as (Sb) (using the mediator as independent variable and CPV as dependent variable) (Table 17).

Model	β	Std. Error
Information asymmetry	-.31	.07
Perceieved risk	-. 71	.06

Table 17: *b and Sb input for Sobel's test*

Perceived Risk

The input values can be found in Table 18 and 21. The results, as shown in table 18, show that perceived risk has a significant mediation effect between BCT and CPV ($p < .05$).

Input	a = -.24	b = -.71	Sa = .06	Sb = .06
	Sobel's test			
Test statistic	3.84***			
P-value	.00			
***. Sobel's test is significant at the .001 level.				

Table 18: *Sobel´s test Perceived Risk*

Information asymmetry

The same test was conducted for information asymmetry. Inputs can be found in Table 17 and 21. The results from table 19 show that information asymmetry has a significant mediation effect between BCT and CPV.

Input	a = -.51	b = -.31	Sa = .06	Sb = .07
Sobel's test	**Test statistic**			
Test statistic	4.13***			
P-value	.00			
***. Sobel's test is significant at the .001 level.				

Table 19: *Sobel´s test Information Asymmetry*

Following, we will test our hypothesis using regressi

5.6 Hypothesis testing

A regression analysis is a statistical method used to study or evaluate the context between one or more independent variables and the dependent variable (Gripsrud, Olsson & Silkoset, 2010). In other words, it is used for explaining changes in the dependent variable using the independent variable. The purpose here is to review the effects as well as the direction of the effect between BCT and perceived risk/information asymmetry. Also, BCT, perceived risk and information asymmetry effects and directions on CPV will be reviewed. Two single-regression analysis and one multiple-regression analysis will be conducted.

Also, we conducted two additional multiple-regression analysis using tamperproof, traceability and transparency as independent variables and perceived risk and information asymmetry as dependent variables. The results can be found in appendix 9.2 and will be used for discussion purposes. Since they do not affect our hypothesis, they will not be highlighted in the result section.

Model fit

Table 20 shows a summary of R square statistics and the independent ANOVA tests for the three regression models. What will be referred to as (1) uses BCT as independent variable and Information asymmetry as dependent variable, (2) uses BCT as independent variable and perceived risk as dependent variable, and (3) uses BCT, information asymmetry and perceived risk as independent variables, and CPV as dependent variable.

Model	R	R^2	F-Value
Model 1: BCT (IV), Information asymmetry (DV)	.41	.17	76.89***
Model 2: BCT (IV) - Perceived risk (DV)	.20	.04	16.10***
Model 3: Multiple regression	.58	.34	62.45***
***. Significant at the .001 level (p < .001).			

Table 20: *Regression Analysis – Model fit*

From Table 20, we see that BCT explains 17.00% of the variation in Information asymmetry (R^2 = .17) and 4.00% of the variation in perceived risk (R^2 = .04),

making the regressions significant (p < .05). BCT, in perceived risk explain 34.00% of the variation in [illegible] making model (3) significant.

Regression and hypothesis testing

Table 21 shows a summary of the regression models and its coefficients that will be referred to in the following sections.

Model	Constant	β	t	Sig.
Model 1: BCT (IV), Information asymmetry (DV)	4.68			
BCT		-.51	-8.77	.00***
Model 2: BCT (IV) - Perceived risk (DV)	3.17			
BCT		-.24	-4.01	.00***
Model 3: Multiple regression	4.56			
BCT		.12	1.73	.09*
Information asymmetry		-.01	-.07	.94
Percieved risk		-.56	-11.70	.00***
***. Significant at the .001 level (p < .001). ** (p < .05). * (p < .1)				

Table 21: *Regression Analysis – Coefficients*

H1 was assessed from model 1, testing the relationship between the independent variable BCT and dependent variable information asymmetry. According to Table 21, the relationship is significant (β = -.51, p < .001). We reject the null hypothesis and conclude that BCT reduces information asymmetry. This supports H1 statistically.

H2 was assessed from model 2, testing the relationship between BCT as independent variable and perceived risk as dependent variable. According to Table 21, the relationship is highly significant (β = -.24, p < .001). Therefore, we reject the null hypothesis and conclude that BCT reduces perceived risk. This supports H2 statistically.

H3 was assessed from model 3, testing a multiple regression model with BCT, information asymmetry and perceived risk as independent variables, and CPV as the dependent variable. According to Table 21, the relationship between information asymmetry and CPV was nonsignificant ($\beta = -.01$, $p > .05$). Therefore, we keep the null hypothesis and cannot say that information asymmetry reduces CPV. This does not support H3 statistically.

In addition, it is important to note that this model is only considering direct effects and not mediation effects. The Sobel's test for mediation indicates that there is a significant mediation (chapter 5.5). Hence, the effects for information asymmetry could be stronger, possibly making the effect significant.

H4 was assessed from model 3, testing a multiple regression model with BCT, information asymmetry and perceived risk as independent variables, and CPV as the dependent variable. According to Table 21, the relationship between perceived risk and CPV is significant ($\beta = -.56$, $p < .001$). We reject the null hypothesis and conclude that perceived risk reduces CPV. This supports H4 statistically.

H5 was assessed from model 3, testing a multiple regression model with BCT, information asymmetry and perceived risk as independent variables and CPV as the dependent variable. According to Table 20, the main effect is marginally significant ($\beta = .120$, $p < 0.1$). However, we cannot reject the null hypothesis and say that BCT increases CPV. This does not support H5 statistically.

Hypothesis	Predictio	
H1: Blockchain technology reduces information asymmetry.	-	-
H2: Blockchain technology reduces customer's perceived risk.	-	-
H3: Information asymmetry reduces customers' perceived value.	-	NS
H4: Perceived risk reduces customer perceived value.	-	-
H5: Blockchain technology increases customer perceived value.	+	NS

Table 22: Summary of hypothesis testing results

6.0 DISCUSSION

The purpose of this study was to gain an understanding on whether BCT could be a means to create value for customers in the credence goods category. Through the literature, we found relations between BCT and perceived risk, as well as BCT and information asymmetry. These relations were kept in the analysis, where we wanted to see what effect BCT had on these concepts, and whether these concepts again had an effect on CPV. Therefore, it was important to capture customer's perception within credence goods, which was represented by organic vegetables, on information asymmetry and perceived risk. This, so that conclusions can be drawn towards whether BCT can be used to affect customers' perceived value within credence goods. In this chapter, attention will be directed towards discussing the theoretical and managerial implications of the results, as well as discussing some limitations and suggestions for further research.

6.1 Theoretical implications

The findings of this thesis are in line with the literature in the area of BCT and its effect on information asymmetry. Zavolokina et.al. (2020) had in their study found that BCT is a means to reduce information asymmetry. They, in contrast to this study, had conducted a study in the experience goods category. Particularly, the findings of this thesis suggest that traceability and tamperproof are significant for reducing information asymmetry (both having a negative effect) (Appendix 9.2). Surprisingly, these results show that transparency is non-significant. Although, previous research indicates that transparency is significant for reducing information asymmetry and shows a negative effect (Rezabakhsh et.al. 2006).

The results revealed that BCT reduces perceived risk, which means that BCT is a means to reduce risk. Indeed, as it was identified in the literature review, consumers try to reduce risk by collecting information (Crocker 1986; Davis, Guiltinan & Jones, 1979). This also implies that BCT is a source of information gathering, which is reliable. As the technology opens up the possibility to collect information that would otherwise be unavailable to consumers, it would make sense that BCT reduces perceived risk, as no other source can provide what BCT is able to provide in the category of credence goods. Our findings suggest that traceability is the only characteristic that has a significant effect on perceived risk,

showing a negative effect. Transparency on the other
be a characteristic that would reduce risk has, indicates a positive effect on perceived risk, resulting in an increase in perceived risk. However, this effect was not significant (Appendix 9.2).

The literature review also addressed the aspect of CPV. This study measured all the identified concepts up towards it. CPV was regarded as the consumers' assessment of how utile a product or service is, based on their perception of what they receive and what they have to give (Zeithaml, 1988). The effect on how perceived risk would affect CPV was analyzed, where the results showed a significant and negative effect directly on CPV. Indeed, when consumers are faced against a high amount of risk, they tend to decrease it by collecting information both from personal and impersonal sources, especially for credence goods (Mitra et.al. 1999). Hence, time and effort is directed towards increasing search cost, which again reduces CPV. Second, the effect of BCT on CPV was tested, where BCT was shown to have a weakly significant but positive effect on CPV. Moreover, with the mediation effect, the main effect is expected to be reduced to 0. Therefore, this result might still be useful. Indeed, as this technology is a service for customers that is unique, it would bring many benefits to consumers. In addition, consumers use time and energy on finding and assessing information when making a purchase. These forms of costs from the cost side of CPV are reduced with the use of blockchain. The reason being that typically, gathering information for credence goods is hard, and BCT is a means to reach this hard to find information. Hence, decreasing search cost, which in turn increases CPV.

6.2 Managerial implications

The descriptive model demonstrated indicates that BCT can be utilized by firms and is beneficial for those operating in the credence goods category. CPV is an important concept in business because it is the most important indicator for repurchase (Parasuramen & Grewal, 2000), which again is closely related to customer loyalty (Morar, 2013). The analysis showed that BCT significantly reduces both information asymmetry as well as perceived risk, and that there is a mediation effect between BCT and CPV (through information asymmetry and perceived risk). In addition, the findings showed that perceived risk had a negative

effect on CPV. Hence, if firms were to adopt BCT to increase CPV, leading to higher loyalty.

Moreover, an increase in perceived risk consequently reduces CPV. In other words, if perceived risk decreases, CPV increases. This result shows that managers can decrease the customers' perceived risk in order to increase CPV. Theory states that providing customers with additional information is a means to decrease risk (Crocker 1986; Davis, Guiltinan & Jones, 1979). Companies can therefore implement such a strategy for their customers. However, such a strategy will have some sort of consequence for CPV, as the cost side will be affected with time, energy and psychological cost. This could possibly be as big of an effect as perceived risk has on CPV, resulting in a zero effect. Therefore, implementing a BCT based platform will result in assuring firms that they do not need to spend more effort in reducing perceived risk through providing information. As consumers will be able to get ahold of this information from a reliable source, their perceived risk will in turn decrease. Also, since credence goods make it more difficult to collect information (Mitra, Reiss & Capella, 1999), BCT will be one of the only sources where one can reduce risk within such a category. Therefore, firms could also adopt this technology, make it a payable solution and increase their revenues. In addition, Resnick et.al. (2000) stated that consumers are potentially willing to pay for such services, as it gives security and comfort, making this a possible solution for firms.

Even though there are many benefits with BCT, in this setting, there are some limitations to adopting it. First of all, there will be an initial fixed cost by implementing such a technology. Also, large scale businesses would need to monitor the added information or find someone that can (Zavolokina et.al. 2020), as well as doing maintenance to the platform. Consequently, firms would need to invest in programmers and personnel that need to watch over the information. However, because it is a decentralized system, they can reduce costs by no longer need third party services to for example, maintain databases, costs related to monetary transactions, costs related to additional paperwork etc. Also, a consumer will assess the information in the same manner if they do not know the benefits that BCT provides. Therefore, many consumers will have to be educated on what BCT actually is and how it affects the way they gather information.

Further, our results showed that BCT is a means to re
asymmetry, which is the root to what Akerlof (1970) described as the market for lemons problem. While it is mainly a theoretical problem, it is still relevant in a practical context because people are not rational with their decisions and few people have foolproof information. Relating this to credence goods, more specifically to organic products, as there is lack of trust in companies that offer organic products, due to incidents where conventional food is sold as organic (Glebova et.al., 2019; Sternfeld, 2009). Further, this can lead to the downfall of the organic market (Giannakas, 2005). Therefore, these sorts of companies, by implementing BCT to their strategy, will be able to present to their customers that they are organic. They will be able to provide their customers with the knowledge that they themselves possess. This can lead to an increase loyalty.

6.3 Limitations.

There are some limitations to this study that should be considered when interpreting the results. The limitations are mainly related to the sampling technique and resources to run the model properly. Also, according to our results, the correlations between the constructs indicate a low divergent validity. This did not come as a surprise, as our literature review suggested that the constructs already correlate in some way.

Moreover, the cost side receives more attention within the concept of CPV, due to it being a quite complex concept that takes a lot of time and effort to cover completely. Consequently, there should be further research concerning the benefit side of CPV, as BCT can have an effect here also.

Furthermore, the sampling technique used in this study is convenience sampling, meaning that the results are not generalizable, and this may have affected the data gathered. We ended up with 89% female respondents and only 8% males, which is not representative for the population. The root of this finding comes from the Facebook group Veggietalk, where most responses were collected, and where there were approximately 82% females. This may be the reason for that we ended up with some deviation from previous literature. In this case, we decided to rely on previous literature and not our own data, which may have affected the results. These decisions were made when interpreting the divergent validity. This could be

caused by our sampling technique or it could be beca
meaning when translating from English to Norwegian.

Moreover, because there was no established scales for BCT, these had to be adopted from similar concepts. Transparency and traceability were adopted from quite similar concepts we are quite comfortable with. However, tamperproof is the product of confidentiality, immutability and security, and the items were assessed using face validity. Anyhow, there was no indications of reduced reliability or validity when assessing Cronbach Alpha's, factor analysis, nor the normal distribution for these items.

Lastly, we believe that information asymmetry has a significant negative effect on CPV. However, we could not prove this with our study. This could be because of the sampling technique and that we were not able to test the mediation effect. By running the model using two single- regression models and one multiple-regression model, we lose the mediation effect and are only able to test single relationships between the variables. Optimally, we should have used a multiple-regression analysis with equation systems in order to include the mediation effects. However, we were able to conclude that information asymmetry and perceived risk both have mediation effects on CPV. Mediation condition (c) (see chapter 5.5) states that when you have a significant mediator, it causes the previous significant effect the independent variable had on the dependent variable to be reduced to zero when controlling for the mediators, which is what our results indicate. Because of that and the way we ran our model, we lost information about the main effects as well as the indirect effect through information asymmetry and perceived risk.

6.4 Further research

First of all, this study focused more on the cost side of CPV. Therefore, it would be interesting to find out how the benefit side would be affected. In addition, we used CPV as a whole, meaning that we did not use the variables within the formula. Therefore, it would also be interesting to see how these variables would be affected by BCT, information asymmetry and perceived risk.

Furthermore, one characteristic from BCT was ignor
was thought to be more relevant in a B2B contex[illegible] interesting to see how this measures up to CPV.

In addition, it would be interesting to do the same research in another country or use a different sampling technique so that the results could be more generalizable.

Moreover, while we only looked at credence goods in our study, in a sense that it was the example used for our survey, a similar study with both search and experience goods would be intriguing.

Lastly, concerning how the model was run and how data was collected, it could be interesting to run the same model using proper tools. Because, we were able to establish mediation effects, we were not able to test for the effects properly.

7.0 Conclusion

This study provides a better understanding of whether BCT can be used to create value, to what purposes it can be used and even establish some theoretical connections. Most results are consistent with indications found in the literature. However, there was no success establishing the relationship between CPV and information asymmetry. Anyhow, the research questions were answered in a satisfactory way.

The findings in this study show that BCT can be used to, at least reduce information asymmetry within credence goods, thus solve the market for lemons problem. The problem was first formulated 50 years ago, before internet was accessible to the public. Today, as the population have access to more relevant information through the internet, information asymmetry is lower than when Akerlof first described the problem. However, there is still some presence of this known problem. Therefore, a way to reduce it, as found in this study, is by adopting BCT, beneficiating both sellers and buyers.

Further, this study indicates that BCT also reduces perceived risk, which was also found to have a negative effect on CPV. This means that BCT can be used as a means to increase CPV, thus, increase customer loyalty. Even though there was a significant effect, it is expected that this effect is even stronger when testing for the mediation from BCT through perceived risk to CPV.

Even though this study was not able to establish a relationship between information asymmetry and CPV, we still believe that there is a significant relationship between the two. Furthermore, the main effect between BCT and CPV was not established. Some of the reasons we believe to be the cause of this unexpected results are described in the limitations.

Throughout this study, there is evidence indicating that firms can adopt BCT in order to create value for themselves in the credence goods category. However, there are several conditions that must be considered. As blockchain is still in a development stage, where we are just scratching the surface of its' potential, finding an effective way to use it is still unsure. Companies need to consider which type of architecture they would want to use, where not every industry have the same needs and therefore different types of usage for this technology. Also,

regarding whether blockchain should be a payable se
figure out which option is more beneficial. However, consumers are potentially willing to pay premium for these sorts of services, as it gives security and comfort, meaning that firms can get a return on their investment through a payable service. In addition, in a B2B environment, firms can reduce their costs by implementing such a technology.

Summing up, by paying close attention on how to increase CPV, firms would be rewarded with loyalty. This study has proven that through the power of BCT, CPV will be increased, through the reduction of customer perceived risk.

8.0 References

Akerlof George A. (1970), *The Market for 'Lem the Market Mechanism*. Quarterly Journal of Economics 84 (3), 488-500.

Animesh, A., Ramachandran, V., & Viswanathan, S. (2005). *Online advertisers bidding strategies for search, experience, and credence goods: an empirical investigation.* In Second Workshop on Sponsored Search Auctions. EC.

Ateniese, G., Magri, B., Venturi, D., & Andrade, E. (2017). *Redactable blockchain–or–rewriting history in bitcoin and friends.* In 2017 IEEE European Symposium on Security and Privacy (EuroS&P) (pp. 111-126).

Ba, S., & Pavlou, P. A. (2002). *Evidence of the effect of trust building technology in electronic markets: Price premiums and buyer behavior.* MIS quarterly, 243-268.

Babin, B. J., Darden, W. R., & Griffin, M. (1994). *Work and/or fun: measuring hedonic and utilitarian shopping value.* Journal of consumer research, 20(4), 644-656.

Badzar, A. (2016). *Blockchain for securing sustainable transport contracts and supply chain transparency-An explorative study of blockchain technology in logistics.*

Bakos, J. Y. (1997). *Reducing Buyer Search Costs: Implications for Electronic Marketplaces*. Management Science, 43(12), 1676–1692.

Baron, R. M., & Kenny, D. A. (1986). *The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations.* Journal of Personality and Social Psychology, 51(6), 1173-1182.

Beatty, Sharon E. & Scott M. Smith. (1987). *External Search Effort: An Investigation Across Several Product Categories.* Journal of Consumer Research 14: 83-95.

Bryant, F. B., Yarnold, P. R., & Michelson, E. A. (1999). *Statistical methodology: VIII. Using confirmatory factor analysis (CFA) in emergency medicine research*. Academic emergency medicine, 6(1), 54-66.

Bryman, A., & Bell, E. (2015). *Business Research Methods*. Oxford University Press.

Burns, A. C. (2016). *Marketing Research, Global Edition*: Pearson Education UK.

Carson B., Romanelli G, Walsh P., & Zhumaev A. (2

hype: What is the strategic business value. McKinsey & Company, 1-13.

Carter, C. & Rogers, D. (2008*). A framework of sustainable supply chain management: moving toward new theory*. International Journal of Physical Distribution & Logistics Management, 38(5), 360-387.

Chang, J., Katehakis, M. N., Melamed, B., & Shi, J. J. (2018). *Blockchain design for supply chain management.*

Child, D. (1990). *The essentials of factor analysis.* Cassell Educational.

Cicia, G., Del Giudice, T., & Scarpa, R. (2002). *Consumers' perception of quality in organic food.* British Food Journal.

Chang, H. H., & Wang, H. (2011). *The moderating effect of customer perceived value on online shopping behaviour.* Online Information Review, 35(3), 333-359.

Choe, Y. C., Park, J., Chung, M., & Moon, J. (2008). *Effect of the food traceability system for building trust: Price premium and buying behavior*. Information Systems Frontiers, 11(2), 167-179.

Creswell, J. W. (2014). *A concise introduction to mixed methods research*. SAGE publications.

Crocker, K. E. (1986). *The influence of the amount and type of information on individuals' perception of legal services*. Journal of the Academy of Marketing Science, 14(4), 18-27.

Crosby, M., Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). *Blockchain technology: Beyond bitcoin.* Applied Innovation, 2(6-10), 71.

Davis, D. L., Guiltinan, J. P., & Jones, W. H. (1979). *Service characteristics, consumer search, and the classification of retail services.* Journal of Retailing, 55(3), 3.

Derbaix, C. (1983). *Perceived risk and risk believers: an empirical investigation*. Journal of Economic Psychology, Vol. 3, pp. 19-38.

Dettmann, R. L., & Dimitri, C. (2009). *Who's buying organic vegetables*? Demographic characteristics of US consumers. Journal of Food Products Marketing, 16(1), 79-91.

Ekelund, R. B., Mixon, F. G., & Ressler, R. W. (1995). *Advertising and information.* Journal of Economic Studies, 22(2), 33–43.

FIBL (2020). *Key data on organic agriculture world world of organic agriculture 2020"*. Retrieved from: https://www.organic-world.net/yearbook/yearbook-2020.html

Ford, G. T., Smith, D. B., & Swasy, J. L. (1990). *Consumer skepticism of advertising claims: Testing hypotheses from economics of information.* Journal of consumer research, 16(4), 433-441.

Fotopoulos, C., & Krystallis, A. (2002). *Purchasing motives and profile of the Greek organic consumer: a countrywide survey.* British food journal.

Fuller MA, Serva MA, Benamati JS (2007). *Seeing is believing: the transitory influence of reputation information on e-commerce trust and decision making.* Decision Sciences 38(4): 675–699

Giannakas, K. (2002). *Information asymmetries and consumption decisions in organic food product markets.* Canadian Journal of Agricultural Economics/Revue Canadienne D'Agroeconomie, 50(1), 35-50.

Girard, T., & Dion, P. (2010). *Validating the search, experience, and credence product classification framework*. Journal of Business Research, 63 (9-10), 1079–1087.

Glebova, I. A., Larionova, A. A., Zaitseva, N. A., Grunina, A. A., Chvyakin, V. A., Takhumova, O. V., & Glagoleva, L. E. (2019). *Organic Aquaculture as a Promising Direction for the Production of Organic Food*. Ekoloji Dergisi, (107).

Gripsrud, G., Olsson, U. H., & Silkoset, R. (2010). *Metode og dataanalyse: beslutningsstøtte for bedrifter ved bruk av Jmp*. Oslo: Cappelen Damm akademisk.

Guo, Y., & Liang, C. (2016). *Blockchain application and outlook in the banking industry.* Financial Innovation, 2(1), 24.

Halton, C. (2019, November 18). *Search Cost Definition*. Retrieved from https://www.investopedia.com/terms/s/search-cost.asp.

Harrington, D. (2009). Confirmatory factor analysis. Oxford university press.

Heale, R., & Twycross, A. (2015). *Validity and reliability in quantitative studies*. Evidence Based Nursing, 18(3), 66-67.

Hecklinger, J. M. (2006*). U.S. Patent No. 7,113,853*. Washington, DC: U.S. Patent and Trademark Office.

Heide, J. B., & Miner, A. S. (1992). *The Shadow Of Anticipated Interaction And Frequency Of Contact On Buyer-Seller Cooperation.* Academy of Management Journal, 35(2), 265-291.

Heskett J.L., Sasser W.E. & Hart C.W.L. (1990). *Breakthrough Service.* The Free Press, New York.

Hill, H., & Lynchehaun, F. (2002). *Organic milk: attitudes and consumption patterns.* British Food Journal.

Holbrook, M. B. (1986). *The role of emotion in the consumption experience: actions and reactions in consumer behavior*. ACR North American Advances.

Hunt, S. D., Sparkman Jr, R. D., & Wilcox, J. B. (1982). *The pretest in survey research: Issues and preliminary findings*. Journal of marketing research, l19(2), 269-273.

Jacoby, J., & Kaplan, L. B. (1972). *The components of perceived risk*. ACR Special Volumes.

Kaiser, H. F. (1974). *An index of factorial simplicity*. Psychometrika, 39(1), 31-36.

Kim, H.-Y. (2013). *Statistical Notes for Clinical Researchers: Assessing Normal Distribution (2) Using Skewness and Kurtosis*. Restorative dentistry & endodontics, 38(1), 52-54.

Knight, F.H. (1948). *Risk, Uncertainty and Profit.* Houghton-Mifflin. Boston. MA, pp. 19-20, 197-232.

Kokemuller, N. (2019, February 12). *What Is Customer Perceived Value*? Retrieved from: https://smallbusiness.chron.com/customer-perceived-value-23692.html.

Krystallis, A., Fotopoulos, C., & Zotos, Y. (2006). *Organic consumers' profile and their willingness to pay (WTP) for selected organic food products in Greece.* Journal of international consumer marketing, 19(1), 81-106.

Lamming, R. C., Caldwell, N. D., Harrison, D. A., & Phillips, W. (2001). *Transparency in Supply Relationships: Concept and Practice*. Journal of Supply Chain Management, 37(4), 4- 10

Lemieux, V. L. (2016). *Trusting records: is Blockchain technology the answer?* Records Management Journal.

Levin, K. A. (2006, march 24th). Study design III: Cross-sectional studies. Evidence-Based Dentistry, 7(1), 24-25. doi:10.1038/sj.ebd.6400375.

Li, X., Jiang, P., Chen, T., Luo, X., & Wen, Q. (202C
blockchain systems. Future Generation Computer Systems. 107, 841-853.

Magnusson, M. K., Arvola, A., Hursti, U. K. K., Åberg, L., & Sjödén, P. O. (2001). *Attitudes towards organic foods among Swedish consumers.* British food journal.

Malhotra, N. K., & Birks, D. F. (2006). *Marketing Research: An Applied Approach.* Pearson Education M.U.A.

Middleton, F. (2019, September 06*). The 4 Types of Validity: Explained with Easy Examples.* Retrieved from https://www.scribbr.com/methodology/types-of-validity/

Mieres, C. G., Martín, A. M., & Gutiérrez, J. A. (2006). *Antecedents of the difference in perceived risk between store brands and national brands*. European Journal of Marketing, 40(1/2), 61-82. doi:10.1108/03090560610637310

Mironenko O (2018) *The world market for organic matter is an open niche for Russian producers*. Retreived from: http://agrovesti.ru/rubrika/article/oleg-mironenko-mirovoy-rynok-organiki--eto-otkrytaya-nisha-dlyarossiyskih-proizvoditeley-

Mitchell, V. W. (1999). *Consumer perceived risk: conceptualisations and models*. European Journal of marketing.

Mitra, K., Reiss, M. C., & Capella, L. M. (1999). *An examination of perceived risk, information search and behavioral intentions in search, experience and credence services.* Journal of Services Marketing.

Mocan, N. (2007). *Can consumers detect lemons? An empirical analysis of information asymmetry in the market for childcare*. Journal of population Economics, 20(4), 743-780.

Moe, T. (1998). *Perspectives on traceability in food manufacture*. Trends in Food Science & Technology, 9(5), 211–214. doi: 10.1016/s0924-2244(98)00037-5

Morar, D. D. (2013). *An overview of the consumer value literature–perceived value, desired value*. Marketing From Information to Decision, (6), 169-186.

Nelson, P. (1970). *Information and consumer behavior*. Journal of political economy, 78(2), 311-329.

O'Donovan, P., & McCarthy, M. (2002*). Irish consu*
meat. British food journal.

Parasuraman, A. & Grewal, D. (2000). *The impact of technology on the quality value loyalty chain: a research agenda.* Journal of the Academy of Marketing Science, 28(1): 168-74.

Resnick P., Kuwabara K., Zeckhauser R. & Friedman E. (2000). *Reputation systems*. Communications of the ACM 43(12): 45–48

Rezabakhsh B., Bornemann D., Hansen U. & Schrader U. (2006). *Consumer power: a comparison of the old economy and the internet economy*. Journal of Consumer Policy 29(1):3–36

Rijswijk, W. V., Frewer, L. J., Menozzi, D., & Faioli, G. (2008). *Consumer perceptions of traceability: A cross-national comparison of the associated benefits.* Food Quality and Preference, 19(5), 452-464.

Roselius, E. (1971). *Consumer rankings of risk reduction methods*. Journal of Marketing, Vol. 35 No. 1, pp. 56-61

Sánchez-Fernández, R., & Iniesta-Bonillo, M. Á. (2007). *The concept of perceived value: a systematic review of the research*. Marketing theory, 7(4), 427-451.

Schmidt, J. B., & Spreng, R. A. (1996). *A proposed model of external consumer information search.* Journal of the academy of Marketing Science, 24(3), 246-256.

Seibold, S. & Samman, G. (2016). *Consensus; immutable agreement for the internet of value.* Electronic document, kpmg. Retrieved from: https://www.disledger.com/kpmg-blockchain-consensus-mechanism.pdf.

Selvi, F. (2007). *Diversity, geographic variation and conservation of the serpentine flora of Tuscany (Italy)*. Biodiversity and Conservation, 16(5), 1423-1439.

Shafie, F. A., & Rennie, D. (2012). *Consumer Perceptions Towards Organic Food*. Procedia - Social and Behavioral Sciences, 49, 360-367.

Sharples, M., & Domingue, J. (2016). *The blockchain and kudos: A distributed system for educational record, reputation and reward*. In European conference on technology enhanced learning (pp. 490-496).

Sobel, M. E. (1982). *Asymptotic Confidence Intervals for Indirect Effects in Structural Equation Models*. Sociological Methodology, 13, 290-312

Sobel test (2001). *Calculations for the Sobel test for* http://quantpsy.org/sobel/sobel.htm

Sternfeld, E. (2009). *Organic Food Made in China.* In EU-China Civil Society Forum Hintergrundinformationen (Vol. 10, pp. 1-12).

Stigler, G. (1961). *The economics of information*. Journal of Political Economy, Vol. 69, pp. 213-25.

Suhr, D. D. (2006). *Exploratory or Confirmatory Factor Analysis*?

Svensson, G. (2009). *The transparency of SCM ethics: Conceptual framework and empirical illustrations*. Supply Chain Management, 14(4), 259-269

Sweeney, J. C., & Soutar, G. N. (2001). *Consumer perceived value: The development of a multiple item scale.* Journal of retailing, 77(2), 203-220.

Sørebø, A. M. (2003). *SPSS: En Innføring i Kvantitativ Dataanalyse*. HIBU Hønefoss.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using Multivariate Statistics (Vol. 5*). Pearson Boston, MA

Taylor, J. W. (1974). *The role of risk in consumer behavior: A comprehensive and operational theory of risk taking in consumer behavior*. Journal of marketing, 38(2), 54-60.

Trochim, W. M., & Donnelly, J. P. (2001). Research methods knowledge base.

van Donk, D. P., van der Vaart, T., Awaysheh, A., & Klassen, R. D. (2010). *The impact of supply chain structure on the use of supplier socially responsible practices.* International Journal of Operations & Production Management.

West S.G., Finch J.F. & Curran P.J. (1995). *Structural equation models with non-normal variables: problems and remedies*. In: Hoyle RH, editor. Structural equation modeling: Concepts, issues and applications. Newbery Park, CA: Sage; pp. 56-75.

Williams, B., Onsman, A., & Brown, T. (2010). *Exploratory factor analysis: A five step guide for novices*. Australasian Journal of Paramedicine, 8(3).

Williamson, K. (2002). *Research Methods for Students, Academics and Professionals: Information Management and Systems*. Elsevier Science & Technology

Williamson, O. E. (1985) The Economic Institutions of Capitalism. Free Press, New York.

Woodruff, R. B. (1997). *Customer value: the next source for competitive advantage*. Journal of the academy of marketing science, 25(2), 139.

Yiannas, F. (2018). *A New Era of Food Transparenc*

Innovations: Technology, Governance, Globalization. 12(1-2), 40-50.

Zanoli, R., & Naspetti, S. (2002). *Consumer motivations in the purchase of organic food.* British food journal.

Zavolokina, L., Miscione, G., & Schwabe, G. (2019). *Buyers of lemons: addressing buyers' needs in the market for lemons with blockchain technology*. In Proceedings of the 52nd Hawaii International Conference on System Sciences.

Zavolokina, L., Schlegel, M., & Schwabe, G. (2020). *How can we reduce information asymmetries and enhance trust in 'The Market for Lemons'?* Information Systems and e-Business Management, 1-26.

Zeithaml, V.A. (1988). *Consumer Perceptions of Price, Quality, and Value: A Means-End Model and Synthesis of Evidence*. Journal of Marketing, 52:2-22.

Zepeda, L., & Li, J. (2007*). Characteristics of organic food shoppers*. Journal of Agricultural and Applied Economics, 39(1), 17-28.

9.0 Appendix

9.1 Survey

Approximately how big of a percentage of the vegetables you buy happens in these places:

1. Locally (local farms, farmers market and similar) %_____
2. Normal supermarket %_____
3. Online supermarket %_____

Approximately how much of the vegetables you buy are organic?
%_____

For the following questions, we wish to know how easy or hard it is to choose organic vegetables. The scale goes from 1 to 5, where 1 is strongly disagree and 5 is strongly agree.

	1 (not likely)	2	3 (Neither or)	4	5 (Very likely)
Many organic vegetables are actually ordinary vegetables	○	○	○	○	○
Many organic vegetables are actually non ordinary vegetables	○	○	○	○	○
I am unsure if organic vegetables are really ordinary vegetables sold as organic	○	○	○	○	○
I have to trust that organic vegetables are what they say they are, because there are no other ways in finding it out	○	○	○	○	○
It is extremely difficult to know for sure if organic vegetables are what they claim to be	○	○	○	○	○
It is difficult for me to know whether organic vegetables are in fact organic	○	○	○	○	○
It is difficult for me to evaluate whether organic vegetables are in fact organic	○	○	○	○	○

Following, we want to measure what reliance you ha
vegetables.

I completely trust in the traceability of vegetables:

	1 (not likely)	2	3 (Neither or)	4	5 (Very likely)
Production methods	○	○	○	○	○
Expiry date	○	○	○	○	○
Geographical origin	○	○	○	○	○
Nutrition content	○	○	○	○	○
Organic certification	○	○	○	○	○

I completely trust that the information about vegetables never have been:

	1 (not likely)	2	3 (Neither or)	4	5 (Very likely)
Manipulated	○	○	○	○	○
Falsified	○	○	○	○	○
Tampered with	○	○	○	○	○
Cheated with	○	○	○	○	○

I am certain that I can get access to all information about vegetables that are:

	1 (not likely)	2	3 (Neither or)	4	5 (Very likely)
Relevant for my purchase	○	○	○	○	○
Important for my purchase	○	○	○	○	○
Crucial for my purchase	○	○	○	○	○
Meaningful for my purchase	○	○	○	○	○

In the following questions we wish to measure your understanding about organic vegetables up against ordinary vegetables. Please answer all questions

I am unsure if organic vegetables:

	1 (not likely)	2	3		likely)
Have different quality than ordinary vegetables	○	○	○	○	○
Have different nutritional content than ordinary vegetables	○	○	○	○	○
Will give a different result than ordinary vegetables	○	○	○	○	○
Is more organic than ordinary vegetables	○	○	○	○	○

I am unsure if organic vegetables:

	1 (not likely)	2	3 (Neither or)	4	5 (Very likely)
Gives more value for money than ordinary vegetables	○	○	○	○	○
Is a more reasonable way to spend money than ordinary vegetables	○	○	○	○	○
Is a better purchase than ordinary vegetables	○	○	○	○	○
Defends a higher price than ordinary vegetables	○	○	○	○	○

I am concerned that purchases of organic vegetables:

	1 (not likely)	2	3 (Neither or)	4	5 (Very likely)
Makes my family and friends to think more negatively about me than if I buy ordinary vegetables	○	○	○	○	○
Makes others feel more negatively about me than if I buy ordinary vegetables	○	○	○	○	○
Makes others to wrongly perceive me than if I buy ordinary vegetables	○	○	○	○	○
Makes others to act more uppity towards me than if I buy ordinary vegetables	○	○	○	○	○

I am afraid that purchases of organic vegetables:

	1 (not likely)	2	3		likely)
Is not safer for me or my family to consume than ordinary vegetables	○	○	○	○	○
Does not have a better effect on my health than normal vegetables	○	○	○	○	○
Has the same health effects as ordinary vegetables	○	○	○	○	○
Can be just as harmful for me or my family as ordinary vegetables	○	○	○	○	○

By purchasing organic vegetables:

	1 (not likely)	2	3 (Neither or)	4	5 (Very likely)
I feel uncomfortable because I think that they are similar to ordinary vegetables	○	○	○	○	○
I feel unsatisfied because I think that they are similar to ordinary vegetables	○	○	○	○	○
I feel unsatisfied with how I appear because they are similar to ordinary vegetables	○	○	○	○	○
I feel more uncertain of myself because I think that they are not different from ordinary vegetables	○	○	○	○	○

By purchasing organic vegetables:

	1 (not likely)	2	3		likely)
It is a waste to use more time on assessing whether they are similar to ordinary vegetables	○	○	○	○	○
It is a bad use of time to assess whether they are exactly similar to ordinary vegetables	○	○	○	○	○
It is an unnecessary usage of time because they are exactly similar to ordinary vegetables	○	○	○	○	○
It is a waste of time because they are exactly like ordinary vegetables	○	○	○	○	○

In this question we would like to know which benefit you have by buying organic vegetables:

	1 (not likely)	2	3 (Neither or)	4	5 (Very likely)
Organic vegetables are valuable	○	○	○	○	○
Organic vegetables are worth what I pay for	○	○	○	○	○
I feel I get what I am paying for	○	○	○	○	○
The price is fair	○	○	○	○	○

Next, we wish to know about your experiences. Please respond as honestly as possible. Remember that no answers are correct or wrong

I know well about product information I can get through:

	1 (not likely)	2	3 (Neither or)	4	5 (Very likely)
Certification schemes	○	○	○	○	○
QR codes	○	○	○	○	○
Radio frequency identification (RFID)	○	○	○	○	○
Blockchain technology	○	○	○	○	○

Experience with the purchase of vegetables:

	1 (not likely)	2	3		likely)
I am capable to assess the quality of vegetables	○	○	○	○	○
I am really happy with my ability to choose correct vegetables	○	○	○	○	○
When I choose vegetables, I am safe about my choices	○	○	○	○	○
When I choose vegetables, I normally do not make mistakes	○	○	○	○	○

In the last questions, we wish to collect some background information about you.

Approximately how many times per week do you eat:

1. Meat _____
2. Fish _____

I define myself as:

1. Vegetarian
2. Vegan
3. Pescetarian
4. Undefined
5. Others _____

Highest completed education

1. Primary school
2. High school
3. Bachelor (3 years in college)
4. Master (5 years in college)
5. PhD

Age – please provide us with your year of birth (for example 1968)

Income – please provide us with your gross income before taxes per year in whole numbers (for example 350000)

Gender

1. Woman
2. Man
3. Other/I do not wish to respond

Civil status

1. Single
2. Cohabitant
3. Married
4. Girlfriend/boyfriend
5. Other/I do not wish to respond

9.2 Regression summary

Model	R	R^2	F-value
Model 1: Tamperproof, Traceability and Transparency (IV), Information asymmetry (DV)	.42	.17	25.91***
Model 2: Tamperproof, Traceability and Transparency (IV) - Perceived risk (DV)	.23	.55	7.19***
***. Significant at the .001 level (p < .001).			

Table 1: *Model fit: blockchain characteristics (IV) and mediators (DV)*

Table 1 indicates that the individual blockchain characteristics explain 17.00% of the variation in information asymmetry and 55.00% of the variation in perceived risk. Both regression models are significant (p < .001).

Model	Constant	β	t	Sig.
Model 1: Tamperproof, Traceability and Transparency (IV), Information asymmetry (DV)	4.75			
Traceability		-.29	-3.96***	.00
Tamperproof		-.17	-3.59***	.00
Transparency		-.06	-1.13	.26
Model 2: Tamperproof, Traceability and Transparency (IV) - Perceived risk (DV)	3.32			
Traceability		-.23	-3.20***	.00
Tamperproof		-.07	-1.57	.12
Transparency		.03	.62	.54
***. Significant at the .001 level (p < .001). ** (p < .05). * (p < .1)				

Table 2: *Model coefficients: blockchain characteristics (IV) and mediators (DV)*

Table 2 shows the blockchain characteristic coefficients on the mediators. For information asymmetry (Model 1), we see that both traceability and tamperproof are significant ($\beta = -.29$, $p < .001$ and $\beta = -.17$, $p < .001$). Also, for perceived risk (Model 2), we see that only traceability is significant ($\beta = -.23$, $p < .001$).