COPENHAGEN BUSINESS SCHOOL
MASTER THESIS

BLOCKCHAIN'S ACCEPTANCE IN A CONSERVATIVE SUPPLY CHAIN

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Number of Characters: 208.338
Number of Pages: 105

15. May 2018.

Abstract

In the face of recent food scandals, such as the E.coli infected cucumbers that killed 16 customers, and a growing awareness amongst the environmentally concerned consumers, sustainability, traceability and transparency is becoming indispensable and a non negotiable demand. Intricate supply chains struggle with providing a fail proof trusting network. This is critical within the fresh produce industry, where epidemics can cost customers their lives, ruin a brand's reputation, and cripple a country's economies. Blockchain is a proven solution that provides shared ledger, an effective way of achieving a distributed consensus in a dynamic and unreliable network. However these features are in some industries seen as transgressive. In the Spanish table grape supply chain destined for Denmark, this is the case. A mutually trusting environment is the assuring body, and does not call for any technological alternatives. We investigated the supply chain to understand its operations and transactions, along with its pain points to uncover why does blockchain not appeal to some stakeholders, and what is necessary for it to be accepted.

We reveal that blockchain has a long way to go and may not be necessary the fresh produce industry within Europe. The nature of the business is based on human trust and relationships, making blockchain irrelevant. However a simple form of blockchain, *TraceChain*, is suggested to ease the skepticism and provide traceability for food safety concerns. At last, we propose that if blockchain were to come into play, the farm-assuring program GlobalG.A.P are well integrated within the entire chain, that they are the ideal candidate to carry out the implementation process.

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B.C. IS 4 BLOCKCHAIN

1. Introduction

There used to be a time, where the norm was to select the most pristine fruit, buy off-season produce, ignoring its environmental footprint, and pick the cheapest product disregarding its origin, toxins and support to the local economy. This however is no longer the status quo in major European cities, especially Denmark (Deloitte, 2013). The modern consumer is concerned and demanding changes. Suppliers and growers must bear this in mind, as the consumers place their money where their mouth is, supporting those who meet their demands of transparency, sustainability and traceability (Oliveira-Castro, Foxall and Wells, 2010). This change in consumer behavior has evolved as a direct response to the fear of the ever-growing threat of climate change and recent food scandals.

As consumers' education on the matter increases, alternatives are adopted; organic is prioritized, as well as, favoritising of local and seasonal produce (B. Hesterman and Horan, 2017). But as with most trends, loopholes appear along the way and frauds exploit these. This has caused an immense downfall in brand trust and loyalty, and divided the consumers away from the brands. A study found that up to 75% of respondents don't trust the accuracy of food labels and 37% would switch brand for more transparency (Label Insight, 2016). No solution for the disbelief and distrust in brands and product information is in near sight, and this can cause detrimental harm in industries where growth depends on fostering brand loyalty (Ibid, 2016). The gap is growing evermore in between the customer and the brands, and this is a critical dilemma for a conscious society that desire to better their purchase choices to reflect and create a positive impact. The demand for transparency and traceability is urgent, and providing this could reunite links within the supply chain that have manifested distrust within both itself and consumers over the years.

Such high demands are not delusional, but every actor in the supply chain is far from possessing the underlying technology to provide this. This especially applies to the fresh produce industry. Growers in lesser developed countries are not up to date on applying technology to improve logistics, and some are the 4^{th} or 5^{th} generation in family owned businesses and do not feel a need to adapt to the requirements of consumers thousands of kilometers away (Deloitte, 2013). A stubborn and antiquated

industry is not one that easily adapts to radical innovations and consumer demands. Sometimes it is just the nature of the industry that prevents the adoption of potential new innovations. However, as history repeatedly shows, those who don't, are usually left behind and forgotten (Kalb, 2013)

A relatively new technology that is taking the world by storm, trialed in almost every industry and showing remarkable results is blockchain. It has is a solution with inherent capabilities to remediate supply chain inefficiencies (Deloitte, 2017). It has unlimited potential and benefits once implemented, and in this given case can single handedly solve the concerns on safety and fraud, and improve logistics exponentially (Charlebois, 2017). When every link in the supply chain, from supplier/grower, to distributor, to retailer, to consumer, has access to known and trusted information, the integrity of every member is exposed creating a mutually accountable mentality. This establishes a full audit trail, uniting all partners to tackle current challenges and ensures a trusting environment for all transactions (Knowles, 2017).

Big conglomerates tend to be the first to venture into such innovative changes (Brubaker, 2015) and some, such as Walmart and Carrefour, have already taken a first mover position (Aitken, 2017). They are investing heavily given the easy access to finance and the negotiation power with suppliers, if they don’t already own them (Carrefour Group, 2018). But in the fruit and vegetable market where competition is near perfect, there are hundreds of suppliers and retailers who fight over the prices and it is not as easily implemented then. Some corporations are just not willing to invest individually, even though they are interested and see that it’s the direction the industry is moving in (Total Produce Nordic). And some have barely heard of the technology but are welcoming it open armed, but expect the initiative to come from elsewhere.

Can this be due to a stubborn industry that does not react well to radical innovations, only have a short term sustainability vision and are the last to take on such changes? Or can it be the technology, that just is not cut out for the industry, won't fulfill the wishes of the customers and will have less benefits than what popular belief states.

The fundamental question however is, can blockchain provide and support sustainability within this industry, or are the measures that are already in place the best we could ask from these partners involved in the supply chain? The phase in

which a firm adopts an innovation is crucial, to its stakeholders, and the survival of the firm and the technology itself. So if the technology and sustainability is proved, it is the organizations take on innovations and the peer networks that will determine its success.

To put this industry under the microscope, a certain supply chain must be selected and analyzed. The table grape supply in Denmark has shifted radically from Italy to Spain over the past 20 years. Spanish suppliers were quick to see a rise in seedless grape demand and implemented innovative practices that has since then led them to overtake the market. With a recently new supply chain it would be fair to assume it would be the first to adopt innovative solutions to customer demands. However as mentioned, the fresh produce industry is an intricate business that relies heavily on business relationships and experience in the field that cannot be applied to technological solutions.

To discover if this supply chain is ready and willing to adopt blockchain, a complete and comprehensive understanding of the supply chain is imperative to identify where and how blockchain will affect and aid every player in the business. Limiting the scope to one produce allows us to compare both big and small suppliers, and research further into if there is a difference in between them. The realm of this dissertation is covering the entire Spanish table grape supply chain, and will pursue to answer the following research question and its respective sub-questions.

Research question

How prepared and willing is the table grape supply chain, between Spain and Denmark, to adopt blockchain as a solution to sustainable traceability demands?

1. How is the supply chain constructed and what are some of the main pain points
2. How sustainable are the stakeholders involved and how can blockchain increase their sustainable position and practices, adding value to the chain?
3. Why is the diffusion of blockchain obstructed and what are the reasons it is met with such different perceptions?

Research value and purpose

Answering our research question will not only shine a light on how the table grape industry and its current challenges. But it will present an overall view of how a supply chain within the table grape industry is constructed and how this affects its stance and acceptance of new innovations such as blockchain. This will provide an in depth supply chain study within the fresh produce sector, and even though each produce have different requirements, the supply chain and the underlying workings of it is similar to other fresh produce. We strongly believe that therefore this study can be used as a background for future studies on the matter.

The sub questions serve as the backbone of our study, going into further detail of the characteristics of both the industry and blockchain. Uncovering how sustainable practices within a supply chain is far from sustainable practices within the business. How these affect each other can guide further research on the sustainability practices within supply chains. Blockchains qualities are imperative to study in relation to its acceptance and we strongly recommend carrying out similar studies on blockchain in other industries. Because with our research question and its respective sub-questions discover that while it may be crowned as the solution to most traceability and transparency problems, it cannot surpass the initial barrier if it does not adapt to the industry, build on the processes already in place, and convey trust.

Thesis structure

How such a specific focality fostered this research can be puzzling, therefore, in section two we will outline our research scope process and path as a case description. Next, in section three, a complete supply chain study and explanation is presented to provide general knowledge on the operations and transactions carried out in this industry. In section four, the current demand for traceability and transparency is covered. Section five present blockchain as a solution to the previous section, and delineate the technology behind it. In section six we present and describe the two theories, Diffusion of Innovation and Sustainable Entrepreneurship, used to shed light on the findings encountered throughout the research process. Section seven runs through our methodology, clarifying our data collection and delimitations. Section eight entails the analysis, where critical thinking is applied to the findings and theories to answer the research question posed in the beginning. At last in section nine we will conclude on all our findings, sum up our answers, and suggest further research options and add thoughts on the future of the industry.

2. Case description: research scope and process

Understanding how we got to such a specific research approach will clarify many of the initial questions one may have about this research. Which is why we start out by presenting the search process and scoping we endured in order to find our angle. Which in turn, also served as the backbone, directing the entire research.

We are constantly waking up to a new era of technology and getting accustomed to what this bears, how it can affect our daily life, and most important, how it can affect our future. Even with Moore's law passing 50 years, it is still incomprehensible the speed at which technologies evolve and are put to use. And when a new technology, such as blockchain, can destabilize the entire chain of value and supply within which it works, it would not be wrong to think that it will be met with resentment and opposition. This was the case for the internet, which is now essentially involved in our everyday life, both at work and at home (Iansiti and R. Lakhani, 2017) We are now seeing a willingness to adapt and a demand for change, from both the industries and the customers, as the benefits of new technologies are more easily communicated to the world.

A sector where this demand is apparent is the fresh produce sector. It involves complex supply chains and globalization spread its network to every corner of the world. For the consumer, it is unmanageable to have the least environmental impact, whilst keeping track of each product supply chain and its involved stakeholders with the currently provided information. In Denmark this issue is taken very serious, in fact Denmark has the world's highest organic share and the most developed organic market in the world (Kaad-Hansen, 2017) proving a growing awareness of their toxin footprint and intake. And while Denmark is leading in conscious consumers, it is still a perplexing task just to comprehend the supply chain of each product. There is only so much the individual can do to take matters into their own hands when it comes to choosing one product over the other with the given information.

How can the Danish consumer trust that each product is organic, know that it has been handled and stored under the right circumstances, and how can it be traced back to the supplier in case of an epidemic without having to dig deep into archives of invoices? Trust issues should not be taken lightly, the loss of trust and business due to a scandal can lead to demise. The 2011 cucumber epidemic in Germany initially blamed Spanish producers. This caused a cease in business with Spanish cucumber growers and suppliers from all their clients, and was estimated to create a loss in the industry of up to 200 million euros a week (The Economist, 2011). When in the end, it was found that the epidemic started on German soil, the damage was already done, harming reputations, economies and wasting food.

This is leading the population to demand a much more transparent supply chain and easier traceability information, freely available for the individual consumer. With more freely available information, the customer can make a more informed choice that in turn can have a positive effect on the environment, supply chain and organization that the customer wishes to support.

Big established organizations and new modern firms already have internal traceability schemes and have digitized most of their transactions. This is because they have either been fostered in a very fast paced changing and technological environment, and therefore have learnt how important it is to adapt to changes and consumer demands, or because they are so prodigious that they have enough funds and resources to make a drastic change and implement new schemes (Alibaba, amazon, Carrefour, Maersk). However, organizations within an industry that dates as far back as commerce itself are less likely to be as adoptive of technologies that satisfy all stakeholder demands.

Choosing and industry

This ignited our curiosity and caused us to direct our research towards older industries, with less tech savvy organizations and practices. More specifically how will they react to a technology that has huge benefits, but is no older than 10 years and to many, still seems like science fiction?

So as we set out to find an industry, we knew that the main criteria would be:

- An industry without huge players (such as Walmart or Carrefour) who are vertically integrated and control various aspects in their supply chain
- An industry where the product is perishable
- An industry where technological innovation could have a big impact
- An industry that fits the realm of the thesis

Choosing an industry in which potential innovation and changes are on the rise is a tough task given it could be any, but through logical thinking it is easy to find an industry which has not been subject to a lot of radical changes which can succumb to this now. Some of the new and emergent industries were raised in a fast paced changing environment and are formed and prepared to adapt to innovation and changes in the business structure. However some industries have been around since the dawn of commerce and exchange of goods. These industries have shaped themselves over millennia, but not succumbed to the same changes that younger industries have.

This is why we chose the fresh produce industry, because it dates as far back as prehistory, is generally still accustomed to its traditional business practices and can be a prime example where reluctance to change and new radical innovation is common. The supply chain that connects the grower in one country with the customer in another is logistically interesting. There are many factors and inefficiencies still prevailing within this industry and is therefore the perfect match for a study, researching blockchains challenges and benefits within an industry essentially operating the same as they did 50 years ago.

That is not to say that the industry players suchs as suppliers and distributors have not evolved and increased both quality and quantity over the centuries with continuous study of the science and biology, optimal conditions, limits and strengths. Also recently, certain movements such as sustainable, organic and regenerative agriculture emerged as a response climate change and over consumption. And while these advances have run parallel with the growing population of the world, the new movements do receive enough funding to substitute our current practices.

Choosing a market

We chose Denmark to be the country of analysis as it is our residing country and is where contacts and communities could be reached out to, along with it being in the forefront of demanding changes to this industry. To be more specific we limited the research scope to to just focus on imports to Denmark given that there are countless angles and perspectives that could be taken and would indeed be insightful and interesting, but should be carried out by bigger institutions with more resources and time. Next, we focused on what fresh produce. With the advances of transportation and a demand for fresh produce all year around, seasons are no longer an issue and fresh produce can be imported from all over the world. This poses two more bifurcations where a decision had to be made. What produce, and coming from where. Choosing what fresh produce is not an easy task as each one poses different challenges; circumstances under which it is grown, packaged, stored, transported and presented.

To simplify this process, we devised a set of characteristics, which the fresh produce should match.

Those being:

- Mature and yet changing sector
- Relatively advanced industry in terms of growing and certificates (This will ensure that the suppliers will be more technological prepared than those whose produce can be transported with no regards to safety and logistics).
- Having special requirements for storing and transportation (requires logistical technology to record).
- Preferably out of season, so we can contact and engage with the suppliers without becoming a nuisance in the peak of the season.

After an intensive evaluation and help from the CEO of Total Produce Nordic (leading firm in fresh produce provision within Scandinavia) Jakob Skanning, with whom we were in dialogue with throughout the entire research period, we concluded that table grapes were the best option.

Table grapes are simple enough as they pose no other purpose than to be consumed after harvesting, in contrast to grapes destined for wine, juice, raisins etc. The grape industry has also changed within the past decade. With cross breeding and hybridization, a commercial success of the seedless grape evolved, and it has taken the market by storm. In Denmark there is hardly any demand for table grapes with seeds anymore, due to the substantial amount of resources and research going in to evolving this product (Henrik Kaalhauge, 2018, March 16, Personal Interview).

Along with this, grapes require strict surveillance and the fertilizer and insecticides used are logged and kept to ensure they meet European standards. When grapes are harvested they are kept at a specific temperature and conditions. We will explain in further detail the processes involved in the harvesting, storing and transportation, in the supply chain section. Last but not least the season in Europe, does not start before early June, which meant full cooperation from all suppliers and other stakeholders.

Which country and why was an easy question, as we went for the country with the biggest variety of suppliers and advanced sector, due to its high demand, and would therefore provide the opportunity for the richest and most extensive research material to enhance this thesis. The largest exporter of grapes to Denmark is Spain, over 40% of the entire year is supplied by Spain (Ibid, 2018), and it has extended its seedless grape season the furthest, from week 24 to week 50 approx. (Ibid, 2018). It is the country that has invested the most in reaching this goal through experimenting with different sorts and different environments. This also makes them the country with the biggest variation in varieties of grape. And at last, the main retailer and distributor of fresh produce in Denmark (Total Produce Nordic) have over the years created a good relationship with its grape suppliers from Spain and therefore constructed a loyal and economic friendship aiding contacts for different steps along the way.

Concluding on an industry, market and product was the initial step to create a compelling case. Analyzing the entire supply chain, the stakeholders involved, their direct interactions and diving into their practices and processes was the next step. To start out we laid out all the possible stakeholders involved in the chain and created a linkage map, contact list, and calendar with due dates to organize the interviewing process. Through this we were granted an in depth field of vision into how the entire chain of supply of table grapes to the Danish market worked. With this we were able to determine the inner and outer workings of every stakeholder involved and uncover friction points, transactions, daily duties and its logistics, personal opinions on blockchain as a solution and the future of the sector itself.

Defining traceability & transparency

The term traceability, transparency and food safety are key words in this thesis, and defining them before we embark on our research, we deem it vital to comprehend the differences, similarities and how they are connected.

We can best define traceability as the International Standards Organization (ISO) does:

"the ability to trace the history, application or location of an object in a supply chain"

(Pikart and Baxter, 2016)

And we can best define transparency as:

Transparency goes beyond gaining visibility into the extended supply chain. It is the process by which a company takes action on the insights gained through greater visibility in order to manage risks more effectively.

(Linich, 2014)

With a traceability scheme it is also possible to identify parts and materials as components to ensure reliability, and in the long term, sustainability. In this context, traceability is the tool to secure food safety within the industry throughout the entire supply chain. For example, with traceability the retailer can assure the customer that the table grapes she/he was buying were handled as the label says, what kind of chemicals were used during the growing process, how much water was used, does it came from a sustainable environment, during transportation and storing it was kept under the right temperature. But has traceability become an emerging business trend, and why do we care more than the previous generation?

We can find the answer in globalization and increased population where sustainability and environmental and social impacts have started to matter more than before. However this territory is relatively young, yet a lot of corporations already have invested heavily in internal traceability schemes and intends to further exploit the possibilities of traceability. If they want to remain on top of their sphere or in the very long term they want to survive, they have to understand their supply chain better, and make it transparent.

There are many benefits of traceability and transparency within the supply chain and just as many with the organization, as it is a must for today's standards. One of the main benefits is that traceability entrusts stakeholders to be accountable for their actions inspiring trust in its stakeholders. For this reasons it helps exclude the possibility of fraud within the supply chain. Better implementation of transparency will help to foster international business connections and relations, risk mitigation, optimal operations and access to new markets to export to. It will also help achieve required regulations implemented by the government in food safety and it would provide sustainable advantage over those who don’t have this scheme. On the consumer’s side, traceability will provide trust in the company and conscious customers will choose a company providing them with these attributes. Ensuring them an ethical production line and supply chain, which excludes violations of human rights and assures fair trade.

3. Supply Chain: description and ecology

Most table grapes in Spain are from Murcia; a region in Spain that is well known for its abundance of sun, stable climate and scarce water. It is said to be the California of Europe in relation to table grape production. How a region with water scarcity can be known for its fresh produce is astonishing, but this region pioneered sustainable irrigation practices, and still use some of the ones implemented by the romans. However, table grapes have only recently become a major produce of Spain. Before it was only wine grapes that were iconic and quintessential of Spain. The grower's perfection of the seedless table grapes transformed the consumers all over the world, which eventually changed the industry. In Denmark there is hardly any demand for table grapes with seeds anymore, and this focused their main source of table grapes, to Spain.

To answer our research question, we must dive in to the entire supply chain of grapes originating from Spain, destined to Denmark. All the operations, processes and transactions are vital to understand the behavior of each sector and the supply chain as a whole. The entirety of the supply chain description was made possible with the help of the interviewees. We will start at the bottom of the chain, which should not be interpreted as inferior, but where it all starts.

Seed and plant Suppliers

While most supply chains bundle growers, suppliers and research groups in the same category, it is often forgotten how big a role the suppliers of seeds and plants play in the industry. This multi billion-euro industry is often overlooked and taken for granted in supply chain models and studies, which is why we started our research there. It turns out that most producers don't actually grow and germinate the seeds, care for the plants early growth until it's ideal size for production, nor carry out hybridization and other research projects to develop new varieties.

After interviewing various table grape producers we found that there are around 4 major hybridization research organizations whose expertise is within seed, plant, and new variety research and production; often co-owned by growers and

vertically integrated organizations. Three of them are located in the land of sunshine, California, which next to Murcia is the ideal environment and main location where the table grape business thrives (not to mention wine and raisin destined grapes). The last one, Investigacion y Tecnologia de Uvas de Mesa, ITUM, is located in Murcia, Spain. ITUM is a leader within investigating new varieties. It is a cooperative co-owned by 24 firms located in Murcia, where the majority are growers and cooperatives of grapes (ITUM, 2018). Two of the interviewed growers are involved in the organization and support the forward research.

Firms like ITUM research:

- Best environmental conditions for each variety
- Harshness threshold
- Resistance to diseases
- Resistance to continuous handling
- Conservation under different temperatures
- Reaction to different and new pesticides
- Low production cost
- Appearance and quality
- Taste matching and new taste creation
- Hybridization
- Genetics
- New varieties

(ITUM, 2018)

During this entire process a tight log of all of the hybridizations and tests are kept in order to document what steps are carried out to achieve a new variety, and which are crossed with which. Since this is done in a laboratory, a scientific approach is taken so once the final new variety is achieved; an extensive and complete journal of its creation process is stored. This is presented as the certificate, ensuring any customer that the new variety is created under the correct circumstances. In order for a new variety to hit the market it must be economically viable.

This can be reached due to:

- Elongated phenology
- Resistance to harsh environments
- Requiring less resources
- Resistance to disease

In essence, the new quality must be one that stands out to previously known and available varieties. It is then patented and registered under the company name. This is where the supply chain starts and the transactions and interest from the producers begin.

From here on, producers of table grapes can now buy the patents to commercialize these new varieties; it can either be the seed itself or an already grown plant (the latter is preferable in order to not waste fields and resources on maturing plants). When growers buy the seeds/plants, they are paying for the product itself, plus a royalty to use this variety. The patent comes with a certification and the genetics map from internal auditors stating what variety it is, and other significant information that can be controlled and checked in the grower's own laboratory.

Once the seeds/plants and patent are in the possession of the growers they can start plantation, string together forecasts and prepare for future harvesting seasons. The seed/plant suppliers and researchers achieve economic gains through research, production and patent leasing.

Traceability scheme

After the goods are handed over and the transaction is complete, the seed and plant suppliers keep a tight control of the output of their varieties. A team is employed all year around to investigate the production of their varieties. In the case of there being a surplus of their variety, they can trace back the suppliers of this variety through traditional methods and from there request from each of these the patent that they have distributed. If it is the case that one of the suppliers do not have the patent, and has committed fraud by stealing from other fields, either the field can be ordered to be cropped or a fine, plus the initial price and premium, is given for the offence.

After the transaction between the seed and plant suppliers and the growers is terminated, the producers can test their purchase in their own laboratories to check if it matches what the patent and certificate states and from there on start the plantation. Some suppliers can further their research with their technical staff, researching new aspects that may not have been covered by their supplier (the lab is different from the fields). The most normal of these, are researching its phenology, its output, survival rate at different altitudes, different irrigation techniques and plantation outside its recommended seasons. This is based on internal testing and trial in order to reach new and better practices for their purchased varieties.

The table grape growers who supply big orders to the Danish market require substantial infrastructure and resources, numerous fields and proper practices and certifications. This is noticeable throughout the entire process of the business, from plantation, to harvest, to packaging, to send off. Not every grape producer have the funds to buy patents for new varieties and have to settle for inferior varieties. This in the long run have detrimental effects on efficiency and can also affect demand considering seedless table grapes takes up the majority of the market share demand. However there are three varieties that are economically viable that have no patents and are available to everyone. But as research progresses, their downsides will eventually outweigh their benefits and turn obsolete.

Table grape growers

Grape vines must be nurtured and cared for in order to harvest a presentable final product. These are the grower's function in the chain where they do everything from sowing, irrigating, fertilizing, harvesting, packing and storing. Some growers specialize in grapes and are therefore mainly only working at peak performance around 4-5 months a year. Others grow fruits with different harvesting seasons that are viable in Murcia. This is mainly citrus and stone fruits. Doing this covers expenses of idleness, and also retains and employs the same workforce all year around.

The growers usually own the plantations, or have contracts with the farmers who have the plantations, to work directly under them. It is uncommon that a farmer works for more than one supplier. Each of these farmers has their own serial number to classify them in the growers system of traceability.

The growers with the purpose of elongating harvesting periods carry out internal research and tests, which means longer seasons, therefore operative for longer time. The biggest corporations only do this, which in Spain is Moyca, as they have the resources and fields at different altitudes where it is worth testing and trying to discover what circumstances suit the new varieties, the best.

Prior to harvesting

Once the growers have their seeds or plants and they are sowed or planted, a log is kept throughout the entire fruit development phase for each field.

In this log, characteristics such as:

- Amount of water used
- Weather from start to finish
- Pesticides and hormones
- Fertilizer used
- Results of active matter content (see text box 1)
- Results of size, color, and hardness
- Variety
- Farmer & harvester

Text box 1

The active component against pests/plant diseases is called "active substance". The Commission evaluates every active substance for safety before it reaches the market in a product. In Europe the maximum allowed is 8 active substances, but each country and supermarket have their own protocol, eg. Aldi in Germany is set at 5. So the suppliers adhere to their most demanding client and use this as a benchmark.

(Food Safety, 2018)

This log will later on serve as a register for each fields product and can be traced back through an internal code that is given to each box in which they are harvested in. When the grapes are in optimal harvesting conditions, the growers' internal laboratory carry out a deciding analytical test of the grapes and check for how many active substances their product has to ensure to it meets the requirements. A final test can also be carried out where a test sample is sent to an external lab where more in depth qualities are searched for, and eventually are sent back to the suppliers via email to be stored digitally.

Harvesting

The grapes are harvested in large 1m x 1m containers that can handle up 200 kg. Each of the containers is given a number, which is linked to the previously mentioned serial number of each field and farmer, and the lot is then passported internally. This is a key point, for it is here where their internal traceability scheme initiates and through this number clients can ask for the register of any grapes with the given number and the supplier can provide it within seconds.

The harvesting season spans out over spring and summer and therefore is submitted to harsh temperatures. To prolong the grapes life and overall increase handling, they are cooled to a 0-1 C in cooling rooms or throughout the packaging process and from there on washed, packed in the desired format, and usually sent away right away. Some growers work under Just In Time manufacturing mechanism. This decreases the need for storage rooms and reduces flow time. Others have storerooms where the grapes are kept at a low temperature to increase its shelf life.

Certificates

Certificates are required by clients in order to do business and only accept external certifications, so fulfilling them is not up for discussion. Some customers such as Tesco have their own certification scheme Tesco Natures Choice (Nurture) where their task force in charge, audits them every year before the season starts.

Then there are global standards that can be divided into two segments:

- Certificates for the Fields:
  - Global G.A.P.
  - Gras (FDA)
- Certificates for the Storage facilities
  - Global G.A.P.
  - BRC (British retail consortium)
  - IFS (International Featured Standards)
  - RFC

Some of these assuring and certifying organizations are global and have become a standard certification requirement in order to do business across borders. Global Gap (see text box 2) certified suppliers are given a 13 digit number called the GGN which is printed on every products label so consumers can check the Global Gaps database to verify they are certified by them. It has become a the minimum standard within Europe and therefore all growers have their own company number that links them to the Global G.A.P. servers as well. Suppliers also use this number for business-to-business traceability and linked to their internal traceability scheme.

Losing or breaching a certificate can result in immediate cancellation of contracts, and for some growers it could mean losing a 10-year contract with Tesco or similar. This in turn would be devastating if suppliers have a portfolio where they heavily rely on one big client compared to a few smaller ones.

Text box 2

Global G.A.P. is initiative by retailers aware of consumers' growing concerns regarding product safety, environmental impact and the health, safety and welfare of workers and animals. Their solution was to harmonize their own standards and procedures and develop an independent certification system for Good Agricultural Practice (G.A.P.). Their standards helped producers comply with Europe-wide accepted criteria. Today it is the world's leading farm assurance program, translating consumer requirements into Good Agricultural Practice in a rapidly growing list of countries, currently more than 125.

(Globalgap, 2018)

Transaction with carriers and its challenges

The growers and suppliers tend to have little to no contact with the transporters, as it is usually their clients (distributors and retailers) that include this in the services they provide. Therefore the contact between these two stakeholders is kept to a minimum where the main concern for the transporters is to know if the goods are packed and ready to be loaded and hauled. Some coordination and collaboration is kept in order to optimize the routes of the carriers, however this is a process that is normalized after having worked in the industry, as the storehouses do not change location and patterns appear.

When the goods are handed over, a CMR (see text box 3) must be filled in and signed by both partners (the driver acting as the representative of the carrier) and both get a physical copy of this, a third is kept with the goods and a fourth as an administrative copy. It is only the few modern and newer firms that scan this document to save on a server.

The only problem that the suppliers have experienced with the transporters are delay of the collection, minor errors, hauled under wrong temperature, and odor from previous haul such as fish or meat, that would ruin the goods. Suppliers can implement a thermometer that tracks the temperature to insure them that the arrival of inferior goods was not the fault of the growers but the temperature under which it was transported.

Text box 3

The CMR is a consignment note with a standard set of transport and liability conditions, which replaces individual businesses' terms and conditions. The CMR note confirms that the carrier has received the goods and that a contract of carriage exists between the trader and the carrier.

Information that needs to be covered in the CMR note includes:

- The date and place at which the CMR note has been completed
- The name and address of sender, carrier(s) and consignee (the person to whom the goods are going)
- A description of the goods and their method of packing - this should be acceptable to both consignor and consignee (however, for security reasons, you do not always want the carrier to be able to identify valuable goods)
- The weight of the goods
- The temperature of the goods (if produce)
- Any charges related to the goods, such as customs duties or carriage charges
- Instructions for customs and any other formalities such as dangerous goods information

(nibusinessinfo.co.uk, 2018)

Traceability

As previously mentioned, each firm have a server under which the individually created code for each batch down to the box is stored. This is logged to their GGN number provided by Global G.A.P. and from there on creates an indirect interlinked traceability system. Customers in Denmark, and all over the world, can at any time and moment enter the GGN number in the Global G.A.P. database to see if they have certified the grower. The tranquility that this provides, comes from within the growers organization as it is initially not created for their customers, but to ensure that every batch can be traced, from which field, farmer, chemicals, other batches it has been next to and so on. These internal standards are what can assure the suppliers that in the case of an outbreak of an epidemic, the time to find the root of its cause is no longer than seconds. Food safety has been and always will be the main priority of produce growers and vendors.

Some of the smaller grape growers cannot supply the international market and therefore cannot attract lucrative contracts with big clients because of the following reasons:

- Will not be considered as a valid grower if they are not Global G.A.P. certified
- Cannot live up to minimum orders (between 25-45 pallets at a time. In comparison, Moyca do 30-40 trucks a day, 33 pallets per truck)
- Too much work and operation change
- Lack of documenting at each phase (no traceability scheme)
- Still producing grapes with seeds

Transporters

The transporters, or carriers, have the most vulnerable position in the supply chain. The reason for this is that they are the intermediaries, and it is always easiest to blame the messenger. Their job is as their title says, to transport or carry the goods from A to B. Over the years it has become normalized for the Danish retailers and supermarkets, buying Spanish table grapes, to work with Spanish transporting firms. And it was to no one's surprise that they all are located within the Murcia region as well. The fleet of the carriers are no bigger than 30-40 and the reason for this, as we

found out later, is that the retailers prefer to be an important client to a medium sized carrier, than a small client amongst millions in a massive carrier organization.

When we refer to transporters it must be clarified that the one who carries out the actual transportation is the driver, an employee at the transportation firm. These drivers are trained for their job and monitored in order to see efficiency, and if not optimal, trained to improve this.

Orders

The carrier's office receives orders from retailers and supermarkets and from there on is instructed on where to go, which supplier provides what and how many pallets of this. Sometimes an order can include goods from various suppliers and it is here where experience in the sector aids the logistics of planning and setting the route for the drivers to improve efficiency.

Prior contact before the pick-up can be to organize their time schedules. Certain factors such as opening hours and when the order is ready can reduce setbacks and therefore optimize the transaction however this is an ongoing issue which seems to them to be an innate problem of the business. Once the driver arrives, it is protocol to fill out the CMR, which is also required to obtain the FSI certificate (a standard requirement for most European carriers), with its relevant information, and the driver must supervise that the information matches what is written. The suppliers will most of the time have the goods at its optimal temperature, and will set it for the trucks cooling system to match (around 2-3 degrees for table grapes).

Setbacks, pain points and competition

A major problem occurs in this step of the process. Certain growers do not grant the drivers access to the storehouse to check the temperature of the goods they are hauling, and sometimes no access at all. This causes distrust in between the partners and forces the drivers to sign the CMR without being certain that the temperature that the suppliers have stated is correct or not. Once the driver has signed of and the goods are in the carrier, it becomes their responsibility until unloaded and signed off at the drop off location. Their clients can call the suppliers to announce this

misbehavior, however is usually given the blind eye as it causes delays and more tension.

The drivers therefore take on the responsibility of the cargo as soon as it signed of and cannot be sure of what they are transporting. And when the cargo arrives it will be the carrier who is blamed if the goods are below accepted quality due to erroneous temperature management. Having no proof to rectify this is the carriers' main problem, causing distrust within the chain.

Another cause of tension is that some warehouses will not provide an employee to load or unload the cargo, so the driver is forced to do this. This is outside their job description and without any previous experience or training, is both dangerous for the driver and the goods.

Competitive low cost carrier organizations have appeared on the market in recent years. They challenge the status quo of these firms by setting up office in Spain, but having their entire fleet in eastern European countries with drivers from the same region. They save costs by using older and cheaper trucks (less environmentally friendly), pay social security in countries where the price is a fraction of what it is in spain and include fewer benefits (less socially friendly), and have no traceability system implemented. Their drivers can spend months on the road before returning to their base, or home country, and are therefore kept at a high usage rate.

Costly errors occur as the lack of experience with the clients, suppliers, routes and language differences create setbacks and insecurity of the goods. This usually leads the supermarkets and retailers to return to transportation organizations that have the knowledge and experience, as this can create long-term contracts that create a healthy business relationship.

Traceability

Most established transportation firms have implemented a traceability scheme for their fleet. Tracking and knowing where their carriers are, is probably the biggest breakthrough there ever was in this sector. Most carriers already included GPS tracking in their carriers over 10 years ago. But with the fast paced technology advances and applications, a much more evolved traceability scheme is implemented. Now each firm has their own application that can be accessed both on computer, tablets and smartphones.

These applications includes information such as:

- Live GPS location
- Traced map of route
- Current Temperature
- Log of temperature from start to now
- Driver
- Km driven
- Km & time left to drive to destination (each driver can only drive 9 hours at a time)
- If doors to the goods have been open
- Air pressure (this is a feature we only found one to have)

Apart from this, a score table ranking drivers from most efficient to least efficient is also included in some firms. Managers can monitor their drivers and through this reward the best performing drivers, and train the worst performing ones. Access to this can be given to customers with a login and passwords but is currently kept internal for the managers to see.

Distributors

The distributors are the middlemen in between the supermarkets and the growers. Their job is essentially to locate the best suppliers for each produce and negotiate prices respective to the contracts they have set with their clients. Distributors whose clients are big supermarket chains and retailers prefer to create lengthy contracts which reach up to 10 years, which is usually revisited and renegotiated before the start of the next season if necessary (once a year). Since having a good relationship with each supplier and regular visits are necessary to carry out quality control, is imperative, the distributors usually have an office in the country of origin of the produce. This way good relationships and easy access to the suppliers is facilitated, and new suppliers are easily scouted when a newcomer enters the market.

The second part of their job is to manage the transportation. When an order arrives, the distributors, place the order for the growers, and then hand over this invoice to their transportation logistical teams. They are experienced within their sector and have a good overview on which carriers to use, depending on the proximity, the order (33 pallets fit in a truck, so if the order is less, they must combine it with other orders, preferably from suppliers nearby), and its destination. A good grasp of this is imperative as the logistics of the transportation is complex and tedious.

The reason why supermarkets and retailers chose distributors to handle their purchases is because they eliminate risk by handing their purchases and the operation it entails, to another firm, whose sole job is to supply them with the orders they place. By this they can rest assured that there order will arrive at their doorstep. And if there are any reclamation, they simply have to contact the distributors instead of the suppliers in another country. They also remove the need to keep good business relationship with all the suppliers and this means no need for offices and similar far away. The same goes for the need to organize the transportation of the orders, which is just another operation and position they relieve themselves of.

An example for this is that Dansk Supermarked (own Netto, Bilka, Føtex, Wupti) only have two employees for purchases, who send the orders to the distributors. And as distributors are experts in handling all their suppliers and transporters, they sustain their strong position within this supply chain.

Some distributors, who sell to smaller and individual shops, place the orders and have a storehouse where the goods can be collected and are sold as a separate market. This way of business is however not preferred as it is complicated and involves dealing with a lot of clients on both sides. However this is necessary as there is a demand for this, but these distributors buy the fresh produce and then sell it upon arrival at a trading post.

These distributors are link in the chain that supplies the small stores and shops. Given the small sizes and large quantity of clients, there is less emphasis on maintaining good customer relationship. This side of the sector usually live in the shade of the big distributors with big clients and is therefore less attractive. The fresh produce is sold in an old fashioned manner, at a market, where the highest bidder, or lowest price, determines the sale.

Orders

Before the table grape season in Europe starts, the supermarket chains and retailers send prospective orders to the distributors. These orders are usually flexible on both price and quantity, as the weather can have a huge impact on sales and price (bad weather does not call for grapes, and stable weather is, unfortunately for all in the industry, never the case in Denmark). Meanwhile the distributors take the forecasts of orders in consideration and set up, or revisit, a flexible contract with its most trusted table grape suppliers. The price, is sent to the distributors clients two weeks prior to delivery, and is adjusted to the market. After this their clients send a program of an approximation of how many trucks, or pallets, of grapes will be needed per week. As the relationship between all the stakeholders grows, this process becomes simpler, more trustworthy and standardized.

The same goes for the transportation firms, however these firms are used all year around for different produce when the table grape season is not in effect. Which means that revisiting contracts is done less frequently and both thrive from their trusting relationship.

To supply the small market, distributors work on a different basis. Their purchases are based on the distributors forecasts and once the table grapes arrive to Denmark, they are sold at a trading post at a price adapted to the market depending on the demand. The share of table grapes within this market is no more than 25-30 %, which make it a less valuable proposition for distributors who have contracts up to 10 years in permanence.

Traceability

Traceability is a key issue for the distributors. But as many of their orders are headed straight to their clients, they do not even come in contact with the produce and can therefore only trace the order on basic measures such as departure and arrival. This relieves them of including this in their internal tracking system. The orders that do pass through their warehouses are upon arrival checked into their system, down to the box of each produce. Once they leave, they are scanned and checked out as they were when they arrived.

Certain measures, such as weekly blind tests can be carried out. They consist of picking random produce, and contacting the supplier, send the serial number and request the log and history of the product. This includes the active matters, fields, who handled it, etc. By doing this they are constantly ensuring that the speed at which they can intercept an epidemic is kept at an ultimate high. Signaling to the suppliers that the history of any product can be required at any given moment. This is the requisite of working within this industry. These measures signal professionalism and set the standard for what the traceability measures should be for all their suppliers

Setbacks and pain points

Setbacks within this sector are kept at a minimum by doing business with the same suppliers over the years, creating trusting business relationships and mutually educating the firms on the best practices. Any mishaps or mistakes are corrected over time with this. By creating good business practices through stable business relationships, any friction points will be treated as a part of the business and not blamed on other partners.

The bigger setbacks or pain points usually resort in discontinuing business with said supplier or transporter. Once again, this also sets the standard and signal what are the minimum requirements to be included in the customer portfolio of these distributors.

Retailer and small stores

The supermarkets are the last link in the chain. They own the shops where the customer eventually purchases the produce, and it is their job to have a good overview of what the customer is willing to buy. After this, the buyers will place their orders to their suppliers or distributors. They can be divided into big chains and cooperatives, and smaller single stores and fruit and vegetables shops. The supermarket chains in Denmark either outsource all their purchasing to distributors as mentioned previously, or have their own purchasing division that basically take on the job of the distributors. If the retailers outsource their purchasing, they only have to calculate how much of each produce is needed to supply all their stores.

Orders & traceability

Modern and advanced retailers have servers, which hold all data of stock in each supermarket and determine how much is necessary to replenish all their stores. This reduces the need for daily stock count and other logistical nightmares. Once this is done, their category buyer contacts the distributors and states how much of each product is needed, for when, and to which of their warehouse it is to be delivered. From there on the supermarket distributes the goods to each of their store locations.

The retailers have a check in and check out system that serves as their traceability scheme. It is interconnected with their stock system and serve as a universal system that can trace to which shop each product has gone too, and if it is still in stock or sold. In general there is less weight placed on traceability in this sector, because advanced systems to count stock and know where each good is have been implemented decades ago. This is becoming the norm for shops with substantial goods and stores.

However smaller shops and stores must rely on manually counting their goods in order to calculate how much is needed when the next order is placed. Running one store does come with its benefits however. And that is, that to trace the product it is only to see if it in the store or not. But then again, it is all done manually and is never documented. When the necessary goods are calculated, the shop owners can either contact a distributor that handle small orders for businesses their size, and they supply them with goods either for pick up or delivery. The other option is to buy goods from a market. Markets like these exist in the outskirt of big cities where big terminals are located for the delivery of produce from all over the world. These markets also serve as a distribution center, but without being for only one single business.

The retailers and shops are constantly competing for market share and over the years, retailers have pushed many of the smaller storeowners out of business due to working on bigger scales. This optimizes the logistics and creates lucrative contracts, which cannot be obtained by a single storeowner.

Customers

The customers are those who purchase the table grapes in the stores. They are the segments that have recently demanded more traceability and transparency from all the produce outlets. Disappointing or lying to this segment can create a movement where the consumer's boycott the shop or chains and can create a huge loss in revenue. This can be in the form of food scandals, employee mistreatment, lack of social welfare, disregard for environmental issues, and essentially any value that the customer deem necessary for the shop or organization to take in consideration.

So far, the customers can trace certain produce to the grower through GGN, however there are no other alternatives in place so far. QR codes have been huge success in Asia but never broke through in Europe (The Economist, 2017). And even though forecasts state that QR is in its acceptance phase in the western world, it is still far from becoming the sole traceability mechanism.

However a new trend of locally produced goods and only seasonal fresh produce is sold is starting to arise. This may be the solution to what the conscious customers are looking for. It does not provide the transparency and traceability they were demanding. But it puts their trust and money in the hands of a single shop owner who is easier to trust than big brands that stand out as powerhouses within this industry.

4. Demand for transparency, food safety, traceability

Today we can buy whatever we want, whenever we want. This is one of the main benefits of globalization; there are almost no limitations in food purchases. We can buy strawberries and grapes in December and apples throughout the entire year. With increased demand come increased production rates and new processes. It is sometimes difficult to track each and every product, or follow it back to its provenance. Therefore we place our trust in the products labels and in what the supermarkets inform us with. The main reasons of increased demand for transparency and food safety are the unrecognizable ingredients, scandals and fraud about false origins and watered down production, and fading quality. To underline our previous statement and to help understand why transparency is vital we present some examples:

"Professional services firm PwC has also been involved in the project and it has estimated that 40% of food companies find food fraud difficult to detect with current methods, while 39% think their products are easy to counterfeit."

(WARC.com, 2018)

"Counterfeit alcohol was again the most seized product in the seventh Opson operation coordinated by INTERPOL and Europol, which ran from 1 December 2017 to 31 March 2018, involving police, customs, national food regulatory authorities and partners from the private sector in 67 countries."

(Interpol.int, 2018)

"In total more than 3,620 tons and 9.7 million liters of hazardous fake food and drink worth an estimated EUR 55 million were recovered."

(Interpol.int, 2018)

"Czech officials found horse traces in a batch of Ikea's "beef and pork" meatballs which had been sold across the Continent. The product came from a single Swedish supplier but was made in the Czech Republic, according to the retailer. Czech authorities stopped about 760kg of meatballs from entering stores. Ikea declined to name the supplier involved."

(Robinson, 2013, Financial Times)

To make the current trends and demands more visible, we created a theory, where we divide consumers and their shopping habits. Approximately ten years ago, the average consumer was beginning to realize, the little knowledge he/she knows about the products he/she purchases every day. The next realization happened about five years ago, where the consumer has started to shop with consciousness, which means he/she strives to shop "healthy" and "sustainably", therefore he is buying more ecological food, but yet he doesn't know the details of production. Then they started to demand transparency, when a simple "eco-label" of such, is not enough, and the customer demands to see from where is the product coming from and how it was treated within the supply chain. So following this logic the demand for transparency could drastically rise in the following years.

Why is the current system failing?

We must ask what can we do to better transparency, traceability and food safety, we must investigate the current system and why it can't hold as much potential. To better understand the concept of the current system and to get an idea of a new one, we briefly walk around two terms, centralized and decentralized systems.

Today most of the companies are using a centralized system to store their data. In this system all data is managed and stored by one server. This method is far from the best solution. One of the disadvantages of this data storage method is the network itself has low reliability and availability, which means if an error occurs and the system can fail, the data will be blocked until a reboot and troubleshoot. The way companies store sensitive data, could provide opportunities to hack their system. Therefore a hacked system could be an open space for fraud, which can lead to extortion. For example in May 2014 eBay got hacked and 145 million users were

compromised. The company stated that hackers got into their data system where this information was stored (Armerding, 2018).

For this problem decentralized databases just might be the right solution. It eliminates all the flaws that the other system carries. Since the data it stores is not located on one server, but several. Solving the "error problem" from our previous example, providing securer privacy and is therefore currently immune from hacking. To hack a decentralized system the hacker would need to hack every block at the same time, which could be millions of blocks at once. This new system can provide businesses a boost in performance by overcoming the limitations on the current system and building a scalable database.

A solution that envelops a decentralized server and database would clearly be blockchain, and it could solve the entire problem that the centralized systems are carrying.

5 Blockchain

In the previous section we discussed why the current system couldn't provide enough transparency and traceability. Luckily we are pushing the boundaries of technological innovation and can solve the problem of a centralized system, with blockchain.

Blockchain, a phrase or shall we say a life changing paradigm that we are bumping into over the past year in Denmark. Forums and seminars are held in higher education institutions to raise awareness on this technology and to disparage the mystery that surrounds it. However the technology has existed for more than ten years now, and we are just beginning to familiarize ourselves with it and see its potential. Corporations are starting to realize that they can destroy the current boundaries of their activities and implement new ones with the help of blockchain technology in order to boost their businesses, create transparency, prevent fraud, and build trust. The list goes on. This is also the reason why this thesis is constructed on and around this innovation as it can generate radical changes in the industries it is implemented in. But before discussing the possibilities and benefits, a clear understanding of the underlying technology is crucial as all partners in the supply chain are involved, which also mean they all have an equally important stake in order for it to function.

Blockchain - definition and history

Blockchain was invented and conceptualized in 2008 by Satoshi Nakamoto. It was originally designed for Bitcoin, the first digital currency, to serve as a public ledger for all kind of transactions on the network without requiring a trusted third party (Bauerle, n.d.). The design has been the inspiration ever since for other cryptocurrencies, platforms and applications.

Blockchain is a constantly growing public list of logs, which are kept in blocks, hence the name. These blocks are recording transactions between computers; in that way these records cannot be altered in any way without altering the whole chain and the network itself. This allows all participants to verify the transactions without a trustworthy third party like a bank for example. Blockchain is often

described as a value-exchange protocol. Exchanging values via blockchain can be completed in a faster, safer and cheaper way than the traditional ones.

The blocks are holding a collection of valid transaction that are coded and hashed into a chain. Each block includes the cryptographic hash of the main block in the chain linking the two. These way users are able to verify each and every block all the way back to the original (Bauerle, n.d.).

In our case, when we talk about blockchain we think about that a large amount of consumers would prefer to make the ethical choice when it comes to the products. Throughout the past years scandals like selling horsemeat instead of beef in more than one country in Europe (Robinson, 2013, Financial Times), or the previously mentioned counterfeit products, has resulted in distrust in consumers. Also the lack of knowledge an average consumer has about the purchased products has revealed the poor conditions, and the need for transparency. Right now when a product is in the finished stage, ergo on the shelf, proving every ingredients origin would be impossible. With blockchain it would be possible to track the whole supply chain, which the product was made of (Providence Whitepaper, n.d.).

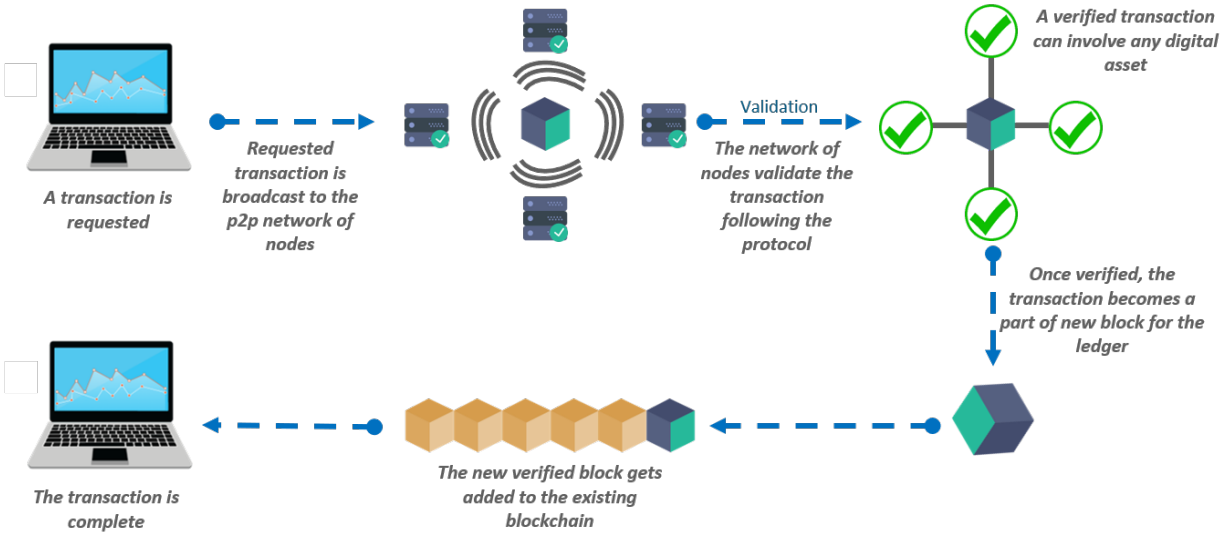
How does the technology work

We briefly discussed how the technology works in theory previously. Now we would like to present it in practice and give a deeper understanding of the technology by looking into the possibilities.

First of all we need to clarify the fact that blockchain is the technology behind Bitcoin, but in spite of the common belief it is not only capable of transferring cryptocurrency. When we talk about blockchain technology we have to understand how it works, but as we take a conceptual approach we will not delve into a detailed description of the technology. However to avoid confusion we will discuss the key points of how it works, the process of validating the difference between the chains (see graph 1).

If we want to determine blockchain in a simple way then we can say it is a decentralized database, which keep digital records about ownership and other data. The system is continuously updated, therefore the data and the block it holds, is constantly fresh.

The technology makes data visible to everyone who is in the network. Hence to the open system it will allow people to trust each other (Bauerle, n.d.).



Graph 1. (Edureka Blog, n.d.)

When we talk about how blockchain works we have to differentiate the network it uses. There are two possible ways to build a network. One is a private chain the other is public. The main difference is what the name indicates, who is able to see the data, participate in the chain. In a public chain everyone can contribute, usually these networks have the motivation to get more people join the network, today Bitcoin is the largest public network. One of the flaws of this, is the vast amount of computation power it requires to maintain the chain functioning. To be more specific to achieve unity, each block in the network must solve a complex cryptographic problem to ensure syncing (Maas, 2017). The other disadvantage is the openness, which provide little or no privacy.

The private blockchain however requires an invitation, which must be verified by the networks creator. The method to control the access of the chain has variability. One of the methods is when current members can discuss and decide on who can enter into the network, the other where the owner of the chain is issuing a license for

participation. Once a new participant entered into the chain it will also be responsible for future members and to maintain the blockchain in the decentralized way (Cuomo, 2018).

What does it solve (benefits)

The blockchain technology offers its users many advantages, we discussed why is it a better solution than the centralized system, and why can it provide better traceability, transparency. With a basic understanding of how it works, we can now proceed to dig deeper into the benefits it offers.

Preventing Fraud

Considering the previously mentioned food frauds and scandals, we would say this feature is one of the most valuable benefits of the technology. The idea facilitates data sharing between the actors all along the supply chain and value chain. Blockchain technology is able make fraud near impossible with the new data storage system where, many computers store data, and it cannot be altered once its written (Mauri, 2018)

Health safety

The technology implemented will improve tracking and will make the supply chain more transparent; therefore it helps products to correspond to the highest governmental health safety protocols more easily. Let's use here Walmarts study to make this attribute more visual. Mango case study / experiment by Walmart proved that to track back a crate of mangoes to its origin in the current way would take 6 days 18 hours and 26 minutes (Aitken, R. 2017). Now in case of a disease, this is an eternity and many lives are at risk within this timeframe. Then they made the same track back procedure with blockchain and it all was done in less than 2.2 seconds. When it comes to health safety this time frame could more likely be the definition between life and death. Tracking will also come in handy when we talk about just a few crates of contaminated products and instead of doing a total recall of products

line, it would be easy to point out the ones that need a recall, therefore the food waste can be reduced (Aitken, R. 2017).

Maintaining quality

Blockchain could make it possible to maintain a certain level of quality. In this case when we talk about quality we do not mean that blockchain can improve quality or texture of the fruit. But what it can do is to ensure a high level of transparency, so if there is a loss in quality due to temperature, it would be clear to find out who's at fault. Also with a closer and more precise monitoring of quality, it would make it more difficult to end up with quality loss (Provenance, 2015). ‘

Ensuring origins

With blockchain it is possible to follow each log entry (which cannot be altered) to the products origins. We talked about the importance of tracking a produces origin from a health and safety perspective. For the consumer it will support building trust into the company and ensures the origin with more than just a label (Provenance, 2015).

Traceability and transparency

We can't stress enough that, traceability and transparency goes hand in hand. For the end users there are no, or very few, solutions or opportunities to look into products supply chain. By making it visible and traceable they (customers) are able to see the production as it is and not as it is stated. Customers will not only be able to see the country of origin, but they will be able to see how the product was treated, what kind of chemicals were used, what was the transportation temperature and these are just a few examples among the many possibilities.

Smart contracts

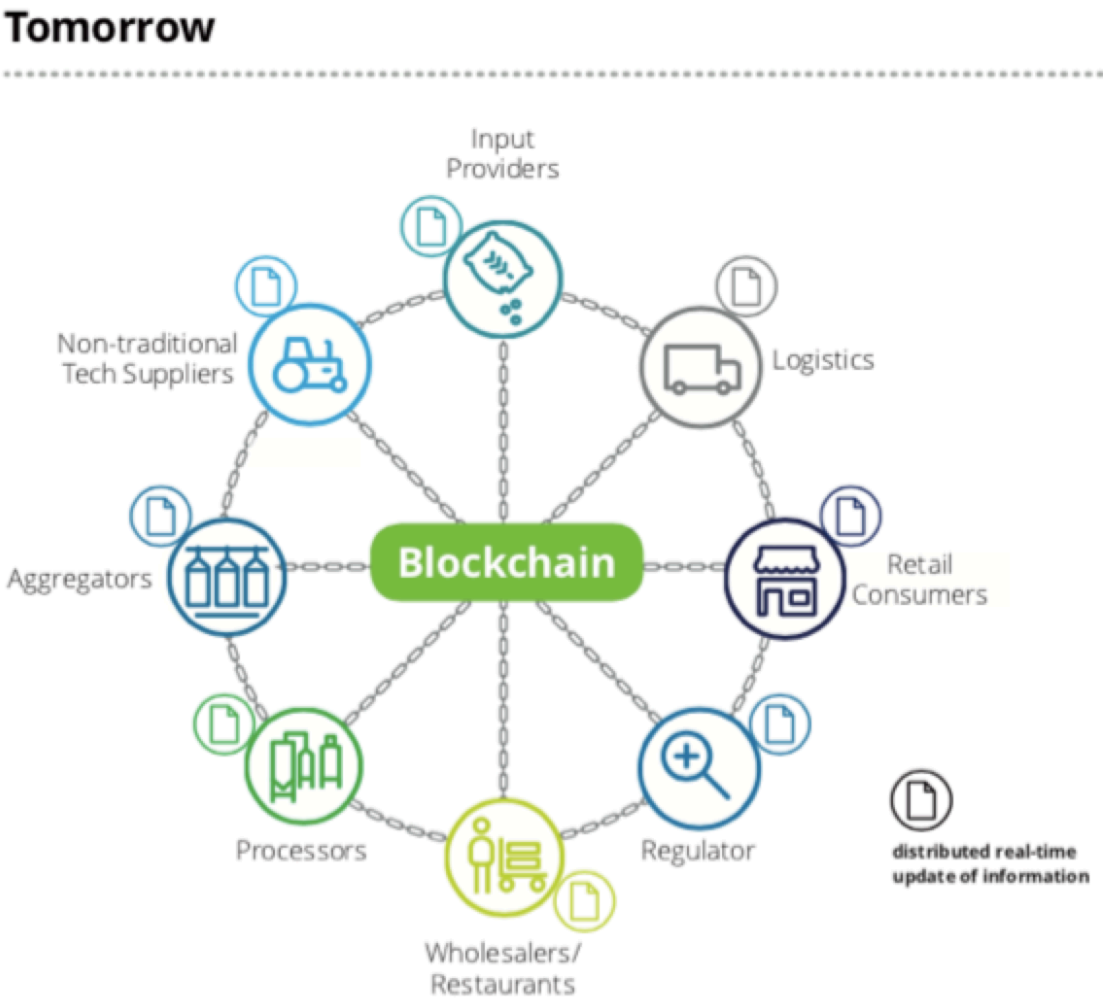
Another outstanding opportunity with blockchain is the smart contract. The decentralized system has many advantages and one of them is that it can be used for creating smart contracts or in other words, blockchain contracts or digital contracts. The main advantage here is that, in this format a contract can be converted into a simple computer code, which can be stored and replicated on the system. It also falls under the supervision of the servers that runs blockchain. This mechanism is also suited to transfer money safely.

How it benefits the Stakeholders

In the current system every firm has their own traceability scheme, internal server, this is to insure themselves if anything were to happen to their product. However it is not connected to their partners and stakeholders. This means that everyone in one way or another is covering their part, to provide good practices, and signal professional care for their clients. However not sharing this with other partners can create distrust and will cause friction in between them, causing an unhealthy business relationship and eventually harming everyone. Making the supply and value chain transparent for the stakeholders it will help to create and sustain trust. A transparent chain will help establish mutual accountability for the future business partners, and ease current practices.

How does it work in a supply chain

To give an idea about how blockchain could work, we have to differentiate between the users. It holds a different approach for the business sector and for the consumer. The easiest to imagine “tomorrow’s” supply chain, is that blockchain connects the whole chain and creates mutual visibility and transparency to the partners. (See Graph 2.)



Graph 2 (Deloitte, 2017)

For the consumers, it might at first seem difficult to understand what blockchain can do, or see how it works, but they don't have to worry about these aspects. The basic process for the customer is to scan a QR-code, or some other digital label, with their smart devices and it will present the products life cycle. Whether this appears on a webpage, application or other, is purely up to the blockchains creator itself.. The consumer will be able to see a vast amount of information about the product he chooses to purchase. For example if he scans the table grapes he buys, he will potentially be able to get information like nutrition, sugar content, texture, origin, producer, age, method of transportation etc.

Challenges and risks to adopt blockchain

In the food business sector innovation will always be desirable. Some of the companies will go ahead and make the first move to manifest new approaches, while others will wait in skepticism and see how it unfolds for the early adopters. Implementing blockchain into a business could do wonders, but there are certain challenges coming along with the success. The world is currently in Bitcoin fever; some are skeptic and most often associate it and confuse blockchain with cryptocurrencies. Of course the two things can be linked together since its the technology Bitcoin was built on, but it is not interchangeable. The other difficulty with implementation is that, if only one company installs it, it will basically be useless without the participation of the remaining stakeholders in the supply chain. So in order to make it works all the participants must adopt the technology.

But if the parties successfully tackle the challenges that blockchain networks set right now, after that they might consider some additional risks. Risks for example strategic risk, where they have to consider if it worth to be on the first movers side and not wait until the technology grows out of its preliminary problems. They also have to consider regulatory risks, currently blockchain has an uncertain fate in terms of regulations. Participants might have limitations in terms of domestic use. Implementers should consider confidentiality risks, which means that partners linked to the technology can view transactions. These transactions are able to reveal sensitive contents even if they are on a permissioned network. Permissioned networks have still accessible metadata, like type of activity or the volume associated with it (Deloitte 2017).

6. Theory

Sustainable Entrepreneurship

Entrepreneurship is one of the oldest practice in human history, which is still evolving since then. According to professor Howard Stevenson (Eisenmann, 2013),

"*Entrepreneurship is the pursuit of opportunity beyond resources controlled".*

Despite its long existence, the practice only gained space in the academic field around the middle of the 19th century (Hodgson 2001). Attention to it has grown over time and entrepreneurs have acted like agents of innovation and shepherds of the economy. In the middle of the 20th century the work of Joseph Schumpeter helped to lay the foundations of the academic entrepreneurship. He also argued in his book (Capitalism, Socialism, and Democracy, 1942) that the key to finding the spirit of the entrepreneurial enterprise lies in finding new combinations and creations. Entrepreneurs have to look for the equilibrium on the current market between the organizations, processes and products. Leaning on Schumpeter's theory on entrepreneurship is a constantly shifting paradigm where culture and value are influence factors, and where in the last decade sustainability gained its ground.

"The continuing commitment by businesses to behave ethically and contribute to economic development, while improving the quality of life of the workforce, their families, local communities, the society and the world at large, as well as future generations. Sustainable Entrepreneurs are for-profit entrepreneurs that commit business operations towards the objective goal of achieving sustainability."

(Crals and Vereeck, 2005.)

Sustainable Entrepreneurship (SE) is the child of social entrepreneurship and ecopreneurship. We can say that this is the next big thing for entrepreneurs and the future generation of managers to face the challenge of sustainability. All the big players now have the responsibility to focus on sustainability. This concept means that they have to use creative businesses to solve environmental and social problem

related to sustainability, but also have a responsibility to set boundaries in the industry to maintain the long term goals viability. In other terms sustainable entrepreneurship turn social problems into business opportunities by utilizing innovation (Parrish, 2010).

In every market segment the leading entrepreneurs and companies have the responsibility to find sustainable business structures, new energy sources, new ways to make the housing and transportation systems more eco friendly, and of course the food industry within this the fresh food business sector there is no exception. However the challenge of keeping the balance between society, the environment and the economy has become extremely difficult. It is the role of the entrepreneur to act as a visionary and to provide solutions. A good entrepreneur has the power to create changes within the industry and turn sustainability problems into challenges and then business opportunities, thus setting a new business model to follow and to prevent crises (Hart and Milstein, 2003).

The prime focus of SE

We mentioned previously that SE is the combination of environmental entrepreneurship and social entrepreneurship. In this section we dig deeper into these segments and briefly discuss them.

Environment

Parris and Kates in their studies (Characterizing and measuring sustainable development 2003. p. 559–586) discuss that the environment refers to the physical world around us. One of the main focus points of SE is to sustain, save and in time restore our natural surrounding, which was demolished and abused by previous entrepreneurial processes. It is also focuses on preserving our natural resources. These attributes can be sustained by the stakeholders of SE, therefore individuals, organizations, and nations are carrying out the responsibility to preserve the Earth's ecosystem.

Communities

SE challenges to preserve communities, and solve social problems with new ways of thinking and doing business (Dees, 2007). Social Entrepreneurship and social entrepreneurs are using the capitals gained by their businesses to provide social well-being. Usually this activity is built into the company's CSR policy. A new method, or trend if you like, emerges beside CSR, which is Creating Shared Value. This term was first used by Michael E. Porter, and the theory focuses on value creation in a way that generates corporate value, along with creating value for social areas along the supply and value chain. The main goal is to create equilibrium with the company's value and business purpose within its social and environmental activities. By doing as little harm to the environment as possible while creating as much value (non-financial) to the community as possible. Because of the above-mentioned reasons the modern entrepreneur has the responsibility to build a supply chain that can fit the purposes of SE.

Responsibility on selecting supply chain

Companies (mainly in the food industry) have a major responsibility on how they construct their supply chain from suppliers and manufacturers, to transportation and distributors. Supply chain sustainability is one form of managing our surrounding environment therefore has impact on the economic and society.

The main objective on selecting the right supply chain is to create sustainable, economic and social growth in value for all stakeholders. Creating these attributes will help to gain trust and loyalty from consumers and clients (Sisco and Chorn, 2010). It will also "educate" the stakeholders to make responsible choices, for example choosing eco friendly grapes coming from sustainable farms. These tasks will be easier to obtain and maintain as more emphasis is put on this along with technological breakthroughs.

Responsibility on value chain

In the previous section we discussed how important or how much of an impact can a company make if they decide to handle the supply chain with responsibility up to sustainable standards. But to create real sustainability, long term, we have to take a look at the other side and see, what kind of value can a company produce and what kind of responsibilities should hold within its value chain.

But why is it so important to a firm to create shared value? Michael Porter created the concept of value chain. According to Porter the importance of creating shared value lies within, the long-term views of the firm. An entrepreneur should create value in order to help society not to harm it. Porter's views are able to provide the company's ability to create value, by exceeding the cost of providing good. It may also benefit the company with a competitive edge within the industry.

Sustainable business model

Sustainable entrepreneurship is gaining ground in a Schumpeterian way (Schumpeter, 2008) against the conventional entrepreneurial ways in the past decade. According to his theory when a business sector reached its boundaries, then a new approach will find a way towards new innovations and solutions, and eventually will destroy the traditional methods. During the emergence of the new trend (SE), new business models were set to follow. A sustainable business model would suggest that SE is able to create social, environmental and social value (Baumgartner and Rauter, 2017).

A sustainable business model focuses on three main attributes (Vladimirova Dr, 2014, New business models for a sustainable future):

Sustainable Economic Value: This attribute focuses on the business process of the company including stability, long-term reliability, financial wellbeing, profit.

Sustainable Social Value: This aspect focuses on the previously mentioned social challenges, like developing communities, creating social justice, protecting labour standards and creating also maintaining positive benefits for the enterprise's environment.

Sustainable Environmental Value: This cornerstone is laying the weight on the environmental values, like preserving nature, protecting biodiversity, creating and maintaining positive benefits for the enterprise's environment.

According to Richardson (Richardson, 2008) the key to implement a sustainable business model into a company's structure is to focus on long term benefits and seek constantly innovative opportunities. Not like current business models, where the focus point is short or mid term profit, and it is failing to promote corporate sustainability.

Benefits for stakeholders

Creating sustainable value and delivering it is not only beneficial for the enterprise but for all its stakeholders. Since the term stakeholder is extremely broad, and incorporates all the individuals and groups that can be linked with the company, it is difficult to determine all the benefits. For this reason we are going to focus on the most important and mandatory benefits a company should provide to its stakeholders. The first, and the most important segment of value creation the company should focus on and the most of its stakeholders are able to benefit from, is the social welfare around the company. By creating social welfare through CSR or CSV, it will not only educate the firm's employees in how to see and tackle certain social challenges, but involving them will help solve problems in a more fundamental way. Therefore many companies take part in philanthropic activities, and making donations or sponsor NGOs. We cannot go by the fact that with these "feel-good" activities not only the community and indigents would benefit, but it will also affect the company's workforce morally. Improving employee satisfaction, and will therefore generate positive public relations liability.

All in all, sustainability from the one hand is an opportunity, which is supported by the consumers who are willing to pay a premium for the products and governments who grant subsidies and provide funds in order to create development and understand the challenges better. On the other hand sustainability and sustainable entrepreneurship is not only an opportunity, but it is mandatory and our basic responsibility to create business models which are able to solve problems before they happen.

Diffusion of Innovation

In the last 50 years, we have moved from exponential technologies to exponential innovations and this unprecedented pace of technological advances shows little signs of stabilizing (Deloitte, 2013). One place to see this is, for example only 12 % of the fortune 500 companies in 1955 are still in existence today (J. Perry, 2016) and the average age of these companies have gone from 60, to under 20 years (Sheetz, 2017). This radical and disruptive innovation era we have moved into is setting the scene for uncertainty. Creating a demand for theories that can help organizations understand and adapt to the unstable environment, and ensure they are coming out stronger with a competitive advantage. A theory that is now ubiquitous in current studies is *Diffusion of Innovation* (DoI).

Diffusion of Innovation aims to explain how an innovation is taken up and accepted by a population or industry (Robinson, 2009). Or as the man who popularized the theory, Everett Rogers, describes it; diffusion is:

"The process by which an innovation is communicated through certain channels over time among the members of a social system"

(Rogers, 1983, p.5)

And an innovation is an:

"Idea, practice, or object that is perceived as new by an individual or other unit of adoption"

(Rogers, 1983, p.11).

The main elements in the diffusion of new ideas are an *innovation*, which is *communicated through certain channels*, over *time*, among the *members of a social system* (Ibid, 1983). Innovation is a broad concept and as mentioned can be just an idea, what is important is that it is perceived by an individual or a unit as a potential innovation. Communication patterns, as described by diffusion previously, centers its concern around communications systems and figures established in order for diffusion to occur. The passage of time is a prerequisite for the innovation to be adopted. And

at last the social system is the combination of external influences and internal influenced. The right combination of these can assure the adoption of the innovation.

The three main valuable insights that DoI offers are:

- What qualities make an innovation spread successfully
- The importance of peer-peer conversations and peer networks
- Understanding the needs of different user segments

(Robinson, 2009)

These insights present an all encompassing study of an innovations potential in its environment and sector, and how to implement it in the process of social change. The characteristics that affect the rate at which an idea is adopted are essentially the qualities of an innovation that triggers the community.

First insight,

Rogers concludes that the main attributes involved in an innovations success are:

Relative advantage

Relative advantage is the degree to which an innovation is perceived to be better than the idea it supersedes (Rogers, 1983, p.15). This is usually expressed in measures that matter to the users, such as economic profitability, social prestige and status, convenience or satisfaction (Robinson, 2009). The nature of the innovation mainly determines what the relative advantage is, be it economic or social, but there are no rules for what constitutes a relative advantage as it is up to the user group and their perception. There are sub dimensions within this (low initial costs, decrease in comfort, immediacy of reward), but the overall generalization is:

"The relative advantage of an innovation, as perceived by members of a social system, is positively related to its rate of adoption"

(Rogers, 1983, p.218).

Compatibility with existing values and practices

This is the degree to which an innovation is perceived as being consistent with the values, past experiences, and needs of potential adopters (Rogers, 1983, p.15). An idea that is incompatible with the widespread values and norms of a social system will have trouble being adopted in comparison to one that is compatible. An innovation should be compatible with (1) sociocultural values and beliefs, (2) previously introduced ideas, or (3) client needs for innovation (Ibid, 1983, p.223). Studies conclude that the compatibility of an innovation, perceived by the members of a social system is positively correlated with its rate of adoption (Ibid, 1983, p. 226)

Simplicity and ease of use

This attribute focuses on the complexity and the degree to which an innovation is easy or complex to understand and use (Ibid, 1983, p. 230). New ideas that are understandable and simple are adopted faster that innovations that require a new skill set and training. There is therefore a negative correlation between the complexity of an innovation, perceived by the members of a social system, and its rate of adoption (Ibid, 1983, p.231).

Trialability

Trialability is the degree to which an innovation can be experimented with. An innovation with trialability makes less of an uncertainty issue for the adopter; therefore, *the trialability of an idea is positively correlated to the adoption of it* (Ibid, 1983, p.231).

Observable results

The observability of an innovation focuses on the degree to which the results are visible to others. Some results are easier seen than others and it can therefore be concluded that the visibility of results to others of an innovation is positively correlated to its rate of adoption (Ibid, 1983, p.232).

These five attributes interact and can identify weaknesses that must be addressed and make a valuable checklist to frame around a focus group for evaluations (Robinson, 2009).

Second insight

DoI highlights the importance of *peer-to-peer conversations and peer networks*. Marketing methods such as advertising and media stories are important to spread information about the innovation. However it is conversations and peer networks that spread trust, as peers with experience have already leveraged the risks and uncertainty (Robinson, 2009). Early adopters are logically excluded from this rule as they tend to be less risk averse, are financially secure, know more about the product and are first to venture into new innovations (Rogers, 1983).

With the spread of an innovation from early adopters to the majority, peer to peer conversations become essential in the decision to adopt (Ibid, 1983). This tells us that the social system in which a new idea evolves, can be the turning point based on their experience of it. Meaning that the decisional point of its survival depends on how others communicate their opinion and trust of the innovation.

Third insight

DoI offers is a comprehensive understanding of the *needs of different user segments*. These user segments are created based on their propensity to adopt a specific innovation and have their own personality. It should not be thought of as a guide on how to move to another segment, but more as each segment being static and having a vital part in the adoption of an innovation (Robinson, 2009). They are divided into 5 separate segments (see graph 3) that can be visualized Rogers figure below, and start with a tiny number of visionaries.

The innovativeness dimension, as measured by the time at which an individual adopts an innovation or innovations, is continuous. The innovativeness variable is partitioned into five adopter categories by laying off standard deviations (sd) from the average time of adoption ($\bar{x}$).

Graph 3 Rogers, E. (1983)

Innovators

Innovators are characteristically venturesome, obsessed with innovation and thrive within a vibrant community of like-minded innovation enthusiasts. This segment usually has substantial financial resources to absorb losses of other failed innovation, along with supporting the development (Rogers, 1983, p.248). Their one-eyed fixation on new and opportunistic ideas can however create a dangerously idealistic appearance that scares away the more pragmatic majority (Robinson, 2009). But no change would exist without risk takers and optimists. Innovators play a gatekeeping role in the flow of innovations into a social system (Rogers, 1983, p.248).

Early Adopters

Early adopters are more integrated in the local social system than the innovators are, and are always alert for what innovators might be pushing forward. As soon as the benefits become apparent, early adopters leap in to get that advantage over their peers (Robinson, 2009). They decrease uncertainty for the adopters to come, as they test out the innovation and iron out the chinks and early stage problems that may occur (Ibid, 2009). This position also rewards them, as they are more economically successful, tend to serve as respectable role models and take a leadership position (Rogers, 1983). Their peers within the social system respect them and their personal evaluation of the innovation can determine the success and future of it.

Early Majority

After a product or an innovation has proven it and leaps over the uncertainty chasm, the early majority welcomes it. The early majority is generally pragmatic, cost sensitive, risk averse, and comfortable with moderately progressive ideas (Robinson, 2009). They hardly ever hold a leadership position and their decision period on whether the innovation passes is much longer than the previously mentioned segments (Rogers, 1983). They avoid complexity, and serve more as a majority, which can really test out the innovation on a large scale. This is also why they serve as an important link in diffusion, if it passes this segment then it is almost set to thrive in every segment (Robinson, 2009).

Late Adopters

They are conservative pragmatists who are very risk averse. The reasons why late adopters may take on an innovation can be due to economic necessity, to answer the increasing network pressure, or the fear of not fitting in (Rogers, 1983). Late adopters are skeptical and cautious, have scarce resources, which mean that all uncertainty about a new idea must be removed before taking it on. The pressure of peers is usually necessary to motivate adoption and assure them the safety to adopt the new innovation (Ibid, 1983)

Laggards

The last ones in the social system to adopt innovations are laggards. They are characterized by being traditional; innovation averse, and will always see risk in changes that are outside their comfort zone (Ibid, 1983). When they adopt a new innovation it may already be superseded by a newer one, which is appearing in the earlier segments. They have no opinion leadership and mainly come in handy as their opinions and skepticism can provide a focus point on how to convince the late adopters (Ibid, 1983)

Each segments personality traits are very different, and depending on whom you are addressing, you must take into consideration their characteristics in relation to their willingness to adopt new ideas. If one knows the percentage of the social system that has already taken on innovation, then it is easy to find out where the focus should be applied to in order to proceed with its spreading and acceptance (Ibid, 1983)

However, with the rise of innovations that affect an entire supply chain, one must not think that every link is in the same segment. For it can easily be confused with generalizations of who may on the surface resemble an early adopter but in reality is one of the late majority holding back the implementation of an overall beneficial innovation. That is why this theory will be implemented on an individual level. Analyzing which organizations in the supply chain are taking a leadership positions, or at least should do so, and which organizations are skeptical. The viability of blockchain in the fresh produce industry is not even reassured to be positive, which

is why one firm may claim the implementation of blockchain is overdue and see others holding back the evolution of the industry. Where another firm may see blockchain as a solution, but not to their position or sector and therefore not show interest or willingness to invest.

7. Methodology

Research Philosophy

In the research process we focused on understanding the supply chain from each firm's individual perspective and its value chain, along with an overall combined comprehension on the supply chain and its functionality. Therefore, we construct the research philosophy around *critical realism* as it is imperative to take into account that each stakeholder interviewed will have their own experiences and sensations, which may vary considering that these are subjective interpretations and can deceive assumptions based on other findings (Saunders, 2009). A prime reason for employing critical realism is that it allows us to uncover the individual perspectives and sensations of each firm and link in the supply chain. This can only be done through directly taking contact with each, as it would prove itself impossible through mere observations (Saunders et al., 2016). Given that more than one firm with the same position in the chain participated, we can construct our own reality on each sector based on the realities provided by each firm, which individually cannot be generalized to conclude an objective view of the sector and industry (Saunders, 2009), providing a more objective foundation for the study.

In the following section, we will present the ontology and epistemology affiliated with this research. Depending on the research philosophy a different understanding of these two arise and clearly distinguishing our comprehension is crucial. Epistemology is about *the way we know* things and concerns itself with investigating how this knowledge is obtained, whereas ontology describes *what things are* and how is this reality understood (Saunders et al., 2016).

Ontology

Ontology can seem very abstract but the way we see the organizations, industry and sector is shaped by our ontological assumptions and with a critical realism philosophy, a structured and layered ontology is consequential (Saunder, 2016). Two extremes exist within ontology according to Burrell and Morgan,

nominalism and *realism*; these two each place themselves on the opposite side of the spectrum (Burrell and Morgan, 1979). The theory *nominalism* assumes that the social world external to the individual is non existent without the labels and names that is given to it by the individual, meaning the nominalist sees no "real" structure as it is all observations and descriptions to give structure to their perceived world (Ibid, 1979). On the contrary, *realism* reasons that the social world exists and the individuals part is irrelevant to its existence made up of hard, tangible and relatively immutable structures, meaning the individual is born into a world having meaning of its own (Ibid, 1979).

Critical realism positions itself in between these two extremes where reality is accepted as independent and external, however we cannot access it based only on our knowledge. What we truly experience is one layer of reality at a time, also known as *layered ontology* (Saunders et al., 2016, p.139). The empirical is experienced, which are sensations and manifestations of things in the real world rather than the actual thing. (Ibid, 2016)

Epistemology

Epistemology and its assumptions deals with whether *"knowledge is something which can be acquired on one hand, or is something which has to be personally experienced"* (Burrell & Morgan, 1979, p..2), in much simpler terms, how we learn. Again there are two extremes in the spectrum: Anti-positivism and Positivism. Anti-positivism is characterized by using qualitative data collecting methods, as for the anti positivist the world is relativistic and can only be understood by the individual who is experiencing it (Ibid 1979). In positivism, data is collected with quantitative methods, searching for regularities and causal relationships to explain what happens in the real world, which is essentially the approach that dominates the natural sciences (Ibid 1979). As critical realists, we take a somewhat subjective approach to knowledge as we recognize that some social facts are social constructions, and these constructions are agreed by its constituents rather than existing independently (Saunders et al., 2016). The knowledge collected and presented is a result of previous sociocultural experiences and backgrounds, and is therefore we take a critical standpoint in regards to knowledge obtained in order to

minimize biases and create academic value. A variety of methods are applicable within the critical realists toolbox, which we will discuss in our research design.

Research Design

An inductive approach has been applied in this thesis. The reason for this was that initially we knew of the potential of the technology and the essentials of the industry, but any knowledge as to how the industry thought and reacted to it was unknown. This approach allowed us to develop and adapt our conceptual framework as we proceeded with the research, also known as grounded approach, as the explanation and nature of theory emerges as a result of the research process (Saunders et al., 2016). Given that we are analyzing an industry that has been around long before technology, and a technology that is no more than 10 years old, it is clear that we had to collect data on the two widely different matters. We must explore the theories that subsequently appeared relevant, in order to "search and recognize meaning in the data and to understand the social context and perceptions of research participants" (Ibid et al., 2016, p.571).

With the flood of cases where blockchain has been implemented, our first step was to interview someone with a good understanding of the industry, its supply and value chain, current stance of it and possible future of the sector. From here on we started scoping down our possibilities and choosing a direction we could take this thesis where it provided the most interest, uncovered knowledge and could lead to solutions, opportunities and further research. Parallel to this a comprehensive research of cases, white papers and an interview was conducted in order to understand the underlying technology of blockchain. This guided the questions and topics that were going to lead the interviews of each stakeholder in the supply chain. As light shone on the case, it became clear that the technology is a revolutionary innovation and it is only a matter of time before industries start to catch on. This directed us to the theory

Our first choice of theory focuses on the entrepreneurial choices that can sustain an advantage for years to come. The theory is *Sustainable Entrepreneurship,* and the role of the entrepreneur fostering sustainability by adapting new innovations and technological opportunities. These can be the key elements what makes the

difference between surviving and growing or nonexistence. So as we discovered some firms were at the forefront of trying new processes and technologies we adopted this theory to explore what these measures they've taken can ensure there future and how it gives back to the community.

To complete our conceptual framework we took on the theory *Diffusion of Innovation,* which aims to explain at what rate new technologies and innovations are spread and how and why they are, or aren't spread. Diffusion of Innovation classifies an entity within the different segments, each with a specific position in terms of the adoption of the innovation and the strengths and weaknesses of each segment. An analysis of players down the supply chain requires some distinction of each one in order to see where they stand in terms of their knowledge, readiness and awareness of the innovation.

We use diffusion of innovation and then sustainable entrepreneurship to try to find a relationship between the organizations position and the sustainability of each. along with analyzing blockchain in the environment that it would evolve in, to research if the qualities of the technology are adaptable to the mentality and working environment of the industry. The process of research orchestrated our conceptual framework, as it was a gradual process following the inductive approach (Ibid et al., 2016), which eventually led us to our research questions.

Empirical method

We predominantly worked with qualitative data collection, suiting critical realism as it one of the acceptable methods (Saunders et al., 2016). The analysis draws knowledge from research articles, case studies, and qualitative interviews in order to compose an comprehensive and academically valuable analysis. While positivists may criticize the qualitative data collection for not resembling their more scientific method, and posing the risk of collecting subjective and unreliable data (Ibid, 2016), we strongly believe that qualitative research will support and facilitate our investigation on how blockchain can benefit the entire supply chain, as we must understand how each individual player perceives the position and the challenges it faces.

Qualitative data is divided into two forms, primary and secondary data. Primary being data collected first hand by the researcher, and secondary is data collected by others for a different purpose, requiring further analysis in order to interpret and adapt it to the case at hand. Secondary data comes in many forms and type of secondary data that we have used in this research is primarily case studies to get a grasp on how blockchain has affected firms and industries in other instances, along with white papers and articles on blockchain itself in order to understand the technology and how it is implemented throughout the entire chain. Secondary data does provide the advantage of requiring less time and resources as the data is already collected, however the quality and relevance is not within control, which can prove itself detrimental (Ibid, 2016).

This is why we rely fundamentally on primary data collected from 8 in-depth interviews, which in turn will support and enhance the secondary data used to lay the groundwork of this research. It is a much more time consuming method and given that this paper analyses a supply chain that extends itself over Europe, it proved to require substantial efforts to travel around, study the culture differences of the countries, and last but not least translate the questions and interviews. While either form of data has its advantages and disadvantages, we saw that collecting data both ways is paramount to obtain the necessary knowledge on each and every level of the supply and value chain.

Empirical delimitation

Delimiting the research scope was the first major challenge we encountered. First of all we started out with an industry we wished to analyze, but time and resources were scarce if we were to venture into a study of the entire fresh produce industry. We therefore selected a specific product that matched our criteria in order to create a study that could be replicated or built upon on other products or the sector itself.

Another delimitation was that even with a specific product and market, we still could not reach out to everyone who supplied this market in Denmark. A limit had to be stated in order to ensure equal amount of time and resources was spent on each stakeholder in order to avoid gathering too little data on a vital link in the supply chain. The same goes for the population or market that is chosen. The technology can benefit any market, we believe, however given that we are located in Denmark, we chose to focus on this market. A good reason for this is also that the Danish population is some of the most conscious consumers and has a substantial amount of disposable income and can therefore choose who to support with their choice of consumption even if it comes at a premium price.

Quantitative data has hardly been used, as there are few statistics that firms can provide without having tried the innovation. This does create some uncertainty to the more technologically interested, but the research scope of this paper is focused on the individual perception of the supply chain and the conception of implementing a radical innovation. So taking a less technological approach, and focusing on how the firms can benefit from this technology on a personal, logistical and trust relationship level is where all the quantitative data will enhance and provide value.

Interviews

Our main source of data came from the interviews we had with each firm, from this we gathered primary data and this gave us the best insight of the company, its processes, and its take on where blockchain could or could not fit in. There are three types of interviews, structured, semi-structured and unstructured, the obvious difference in between these are the formality and the structure of the interviews (Ibid, 2016). We went with semi-structured interviews as we had some themes we wanted to the interview to cover. Those were: traceability, supply chain and processes, friction points, transactions, blockchain and sustainability. Under each of these themes we had written down some points we wanted to cover but used them only as a checklist for us in order to assure we covered everything. This gave the interviewee freedom to lead the interview into new directions and covering aspects of the matter that we were unaware of. As we learnt more about the industry as the interviews proceeded, we

became more awareness on the topic and adapted some of the questions to be more clear and conceptual to the interviewee.

Some disadvantages with semi-structured interviews are the time constraint (Ibid, 2016), which we did not encounter because for the grape suppliers they were out of season, hence they were not as busy as one would have expected. For the rest of the stakeholders we asked for more time than we thought we needed to ensure that if the time were to surpass our calculations, we would have some extra time to cover the whole spectrum of our analysis. Trust and bias are a more serious disadvantage (Ibid, 2016) considering we interviewed an entire supply chain and firms who are directly competing against each other. Respondents are more reluctant to let interviewers in on their business and practices since there might be a well kept secret sustaining them a competitive advantage, however we counteracted on this by offering to sign an NDA with every firm to ensure that anything mentioned would confidential. This guaranteed an overall sense of safety and smoothened the entire process.

We carried out all of our interviews out face-to-face, interviewing one firm at a time. We started with the suppliers, at the top of the supply and value chain, and from there on moved down to the transporters and so on. A certain challenge was the culture difference and the language barrier. To tackle this the questions were translated to Spanish and carried out in Spanish with the firm located in Spain (suppliers, transporters, retail office) and the same in Denmark (retailers and supermarkets). This was to ease the comfort and natural of the conversation, and gave us the advantage of knowing that there would not be any misunderstandings or miscommunications.

Questions were kept at a range from open, probed and closed questions, as some were following up questions and others were to start on a new topic and keep it as open and freely moving as possible. Qualitative semi-structured interviews were the best option for us to understand the individual's interpretation of their world, assuming each individual represented the entire firm. Fortunately all individuals did have a very comprehensive grasp of the entire business operations carried out within the firm and the industry itself. However it is imperative to not influence the answers

or mood by asking any questions that are out of bounds and interpreting each answer must be done in line with our research philosophy.

Interviewees

To ensure an equal perception of the supply chain we chose to interview suppliers of different calibers, including suppliers who do not supply to the Danish market unless a certain deficit arises from the usual suppliers. To understand this sector we also used our contact within the distributing sector in Denmark to better comprehend which suppliers are chosen and why.

We have chosen to interview different companies within each sector of the supply chain in order to get a well-rounded perspective (see chart 1). To support our findings, we combined it with reports, press releases, articles, websites and journals.

Chart 1

Interviewee & role	Sector & company	Date of Interview
Jakob Skanning CEO	**Distributor** Total Produce Nordic	Continuous contact
Jose Luis Sanchez *General Manager*	***Grower*** *Blancasol*	*April 6, 2018*
Pedro Robles *Engineer*	***Grower*** *Moyca*	*April 6, 2018*
Mariano Garcia *Loading and Unloading* ***Domingo Ruiz Lopez*** *Traffic export*	***Transporter*** *Tradomi*	*April 7, 2018*
Cristina Garcia Carrasco *Financial Director* **Elistabet Garcia Carrasco** *Import Traffic*	***Transporter*** *Garcia Carrasco*	*April 7, 2018*
Henrik Kaalhauge *Executive Director*	**Distributor** Total Produce Sourcing Spain	*April 10, 2018*
Stefano Minischetti *Sourcing Technical Manager*	**Distributor** Total Produce Nordic	*April 30, 2018*
Thomas Feld Category Buyer	**Retail** Dansk Supermarked	*May 2, 2018*

Growers

We interviewed two growers; both from the region of Murcia as the majority of table grapes originate from there. The difference in between the two growers is their size, their technological advancements and innovativeness. We reached out to smaller firms to enquire their thoughts and stance on the industry and blockchain. But were met with resistance as none of these growers were able to supply the Danish market due to their size and lack of proper certifications and practices. This was however enough to deduce certain assumptions of what their part is in the chain and what they lack in order to even be included as a potential supplier.

The first grower we interviewed was **Blancasol**, which is a stone fruit, citrus and table grape grower. The reason the grow various fruits is to fill up an entire year with different seasonal fruit in order to be operative all year around. Blancasol´s purpose within this analysis is to provide a perspective from a supplier that is big enough to export to the European market but is still operating under analogic measures. With this we mean that all invoices, orders, and registers of the fields and their treatment is kept in paper form. Blancasol will provide the perspective of a grower that is big enough to be included in the market but not the most advanced technologically. Their position on blockchain and the industry will be of great value as they are not the innovative firm and have long time experience in the industry and can uncover the pain points that blockchain might cure or not.

The second grower is **Moyca**. Moyca is a relatively young company dating back to the 1995 that specializes in growing seedless table grapes. they invest heavily in research and keep pushing the harvesting season further each year with their successful innovative practices. Their logs of the treatment and movement of goods is all kept in digital form, along with the certifications and other circumstances that relate to the product and their practices. Moyca is considered to be the best in the business and have over the years grown exponentially, consolidating themselves as the leader within their sector. Their take on blockchain and the industry will serve of great value as the most innovative and leading firms are those who will posses the most knowledge on blockchain. along with this their operations and practices are also

adapted to newer technologies since their growth is recent, proper research in the most efficient and productive measures is carried out.

Transporters

For the transporting firms we chose two firms that are regularly used for the table grape season in between Spain and Denmark. These two firms also operate outside the season and carry other produce to the same clients. This entails a good business relationship and a deep understanding of the industry.

The two companies do not differ in any grand manner. Both of their fleets are below 50 trucks and they both have some sustainable practices and believe in organic growth. These two companies are **Tradomi** and **Garcia Carrasco.** Both provided different points of view of what the industry lacked and how they see themselves within it.

We had intended to reach out to transporting firms that are not included in this industry, but the reasons we sufficed with the previously mentioned were fairly obvious. The transporting firms are usually located in the region where the produce is grown. So many of these firms specialize themselves through location. And the firms that are available nationally and differ from the two above-mentioned firms are excluded. The reason for this is because they don't have any traceability scheme, and lack of knowledge of where one's carriers and the goods it holds are, is a big deal breaker within this industry. Other issues such as social problems and cheating the proper business ethics are also reasons why these companies are excluded from any type of business with the distributors in Denmark.

Distributor

We mentioned the big influence and role that the distributors have. We chose **Total Produce** as the main distributor as they are the biggest within Denmark. We were in contact with the Danish office, Total Produce Nordic, and the Spanish one, Total Produce Sourcing Spain. We covered all of the business operations from the Spanish office to the Danish and then to their clients. A constant contact with the CEO of Total Produce Nordic ensured we could ask questions on the operations and options of the industry. In other words, we could always enquire more information on

what alternatives there were to buy table grapes from Spain in Denmark besides using retailers purchase teams or their distribution channels. They provided plenty of information on how their competition worked, and how other forms of distributors took the remaining market share of the industry. Through them we covered the industry´s remaining possibilities of table grapes export.

Retailer

In Denmark, most retailers are owned by bigger parent companies. We had initially set out to interview three different supermarket chains, but as we found out we settled for **Dansk Supermarked,** as they own Netto, Føtex, and Bilka amongst other chains. This means Dansk Supermarked have the biggest market share in retail stores and therefore support the case with the best inside information. Dansk Supermarked have also outsourced all of their purchasing department to Total Produce, linking the two organizations together. Making a trail of transactions easier to see, and providing better knowledge on both their parts in the industry

Assessment of reliability, validity and generalizability

Certain factors across the research process must be taken into consideration in order to analyze validity and reliability, and from there evaluate its generalizability, and to what length it can be generalized (Saunders et al., 2016).

External reliability can be questioned by anyone who was not part of the research and is therefore not strong. We do however believe that replicating the interviews would give similar answers, be it within the company or the sector. Since we interviewed various firms within the same industry and did our best to cover the aspects that were not included within those firms, we stand strongly by our findings and believe there is a trend to be followed within our findings. This should create a stronger sense of reliability, supported both by interviews with top management within each sector and a strong research phase in the industry and its operations before the interviews were carried out.

The validity of our research will be determined by our methods and how we used them to gather information. Our entire knowledge gathering was obtained through interviews. We also had previous knowledge of the industry and a connection and relation to some of the big players and individuals within the industry. All interviews were recorded and NDA´s were offered to each and every one. This promised us honest and serious answers, along with dialogues that went further than what a conversation with someone inexperienced in the industry would obtain. Gaining perspectives from different entities in the same sector also gave us the opportunity to cross check our findings to see if there were any answers outlying the patterns we uncovered.

The validity can be questioned given our inside access to these interviews, however the process for research was carried out in a neutral manner with the purpose of creating academic value to the industry and other industries that could mirror our findings. We do therefore state that the generalizability is high when used in reference to other fresh produce supply chains. The reason why we carried the research out was to create a frame for new research on similar topics, be it within or outside the fresh produce industry. Because what this all comes down to, is supply chains of goods, which are usually carried out by some of the same actors in other supply chains and require the same knowledge on logistics and customer handling.

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8. Analysis

Analysis in the light Sustainable entrepreneurship

In the next section we will analyze our findings during the interviews and research, and discuss them in relation to the mentioned theories. Our aim is to look into every aspect of our research question, to explore the existing sustainability measures on the market and the willingness to create a sustainable supply and value chain within the industry segment under our scope with entrepreneurial innovations. We will also discuss the relation between sustainability and blockchain and how it can be achieved with this technology

As we progress we will differentiate the sectors in the supply chain, furthermore we will use the companies within each sector as a supportive example.

How can transparency be achieved with blockchain

We believe that in the race towards sustainability, all features are important, but transparency and traceability possess the key to fulfilling the growing demands. Blockchain could hold the potential solution to improve these factors, and to reduce the costs of administration. The technology is able to provide the companies with a method to record and communicate their certifications, locations, prices, dates and any other relevant information within the industry. It also provides mutual accountability and traceability scheme inside the industry. Therefore the effectiveness will increase when it comes to supply chain management. Adopting blockchain will give access to this information and will increase visibility, compliance and help to eliminate fraud and counterfeit products from the chains. Furthermore it can increase traceability and transparency in the material supply chain. Considering all of these factors it would significantly increase the company's position on the market and in the eyes of its stakeholders.

As blockchain passes the hype, it is becoming clearer that it is a more tangible technology; therefore large corporations are starting to explore its options with it. These companies already realized that blockchain driven innovation will create a

clearer supply chain and the more transparent they are the more potential value they create by reducing risk and improving efficiency.

Blockchain would be able to provide its implementer with an end-to-end tracking system in the supply chain. The users will be able to go digital, this means they could digitize their assets like contracts, orders, certifications, transactions and make it possible for others to get access therefore they are providing transparency for their partners in the supply chain and for their consumers.

Transparency and traceability equals sustainability

The demand for transparency and traceability toward companies' environmental and social activities has drastically grown over the past years. This demand came from consumers, investors, shareholders, regulators and other stakeholders driving sustainability to become more of a business priority. How do we know that a company is taking actions towards sustainability, create a fair work environment, or is following food safety regulations, when we can't see their actions because of lack of transparency?

One of the best examples for lack of transparency is the German cucumber scandal in 2011. A mysterious E coli outbreak happened in Germany and took 16 people's lives. For a long time the authorities believed and reported that Spanish cucumbers caused it. The truth is that while the cucumbers contained the bacteria, they were not the source. The main problem was that they were stored with an infected batch of another product. Germany blamed Spain for the infected cucumbers with no proof of evidence. This problem caused severe damage to the integrity of the supply chain, and lots of companies went bankrupt. It also caused serious social damage among the Spanish farmworkers, because of the false accusations 21% lost their jobs (Tremlett and Pidd, 2018). All of this would have been prevented with an internal traceability scheme, which could provide transparency to the actors in supply chain, and also for the consumer.

In order to make valid progress towards sustainability through transparency and traceability, we first need to realize the gaps we have within the supply chain and prioritize them. It can vary given the supply chain and the related companies nature. In the eyes of the modern consumer, companies cannot be sustainable if they have something illegal or irresponsible to hide. As technology improves new ways are coming up to create transparency and traceability.

Many corporations engage with new technologies to inform end users that this is a company that they can trust in and have nothing to hide. For example Ice Breaker a premium clothing company from Australia, who is making sweaters and sport apparels from wool. They put a "baacode" in each and every product they make, and the customer can track back the wool to its origin. With this method, Ice Breaker provides full transparency, because they already understand that transparency and traceability leads to sustainability.

Can sustainability be achieved through blockchain?

As we previously concluded, the fact that sustainability cannot exist without traceability and transparency makes them both indispensable. We might have a solution that creates the necessary standards towards real sustainability. We believe that blockchain could make a difference in terms of tracking as products moves in the supply chain, sending alerts of any misuse or other unexpected errors.

Is blockchain sustainable in practice?

Well the honest answer to this question is that, we don't know, yet. In this industry blockchain is in an experimental state, and you have to unite a lot of entities if you want to implement the technology. But it is starting to become clear that the technology is not for everyone. As we made it clear, it certainly has potential to create transparency within the industry but we believe it will not be a cornerstone of it. Unfortunately we can't give exact examples as to if it is sustainable, because only research has been made among those who would see potential in implementation (Moyca, Blancasol, Transporters, Personal Interviews). The others consider this

technology invalid for improving their sustainability and they are researching for other methods (Itum, Dansk Supermarked, Personal Interviews).

Sustainable entrepreneurship focuses on two segments of problem

In this section we are going to take a look at what kind of difference blockchain can make to ensure sustainability and transparency. First we will look into solutions to the environment and then the presumable impact to the community.

When we talk about environmental sustainability most of the efforts and programs of the companies are aiming to stop climate change and reduce CO_2 emissions. With implementing blockchain it would be possible to reduce time and increase efficiency. Now we are going to present some solutions using blockchain that could solve current environmental issues.

Then in the second part of this section we will focus on the other component of sustainable entrepreneurship. We will investigate social challenges that it would be possible to solve or make a difference utilizing blockchain.

Environmental problems along the supply chain

Environmental sustainability along the supply chain is an urging factor for businesses. The growing public awareness demands transparency and sustainability to solve environmental challenges we are facing. Harmful environmental impact can occur from irresponsible water usage, electricity consumption, false environment alliances, packaging and food waste and also it can occur from improper handling of the product. Certainly there is an increasing demand to make a combine supply chain with sustainable choices. There are already an existing trent to implement traceability and sustainability programs into a company's policy to help the environment, but these actions are not unified they are not looked at one common cause and they try to solve these problems separately.

We believe that every participant should handle the supply chain as a whole and common problem and stop focusing only on their share of it. Realizing this would be the first step towards a sustainable and transparent future. Now we take a look into some of the environmental problem and see how blockchain could help create a change.

Water usage

Water is essential to life and unfortunately we don't have unlimited supply. There are already parts of the world where water scarce causing huge problems and it is estimated by 2025 around 1.8 billion people will be living in water scarce areas (Medium, 2017). The freshest scarcity problem is in the United States, in California. Another region with water scarcity is a more relevant to us; it is the Spanish territory Murcia. However there are regulation is the region there is still not a sustainable solution for the problem. Others too have to take care of using water supplies for example during production of the grapes. Right now, the growers for example Blancasol is using humidity measuring devices to know how much water they should use. They are also collecting all the rainwater; they even installed a new roofing system to better this practice. Evaporation caused by storage rooms are also collected in the form of water in addition they use the water from defrosting storing rooms. With this method they set an example to follow, but this practice might be improved further with blockchain. However blockchain can't track water, but it could increase the efficiency, tracking the consumption and distribution. With a public water distribution record it would be possible to see the differences and change methods. This would increase reaction speed and effectiveness, when it comes to implementing changes (Blancasol, Moyca, Personal Interviews).

Electricity consumption

The Spanish electricity market has a similar problem than the one with water consumption. However it is not pushing obstacles because it scarce, but it is governed with stupidity. This problem came up along all of our interviews with the producers and transporters. Both of the sectors would happily invest into solar panels and would fund further researches, but the Spanish government has certain regulations, which hold these initiations back. Most of the European countries support these initiatives, with the government providing favorable regulations, laws and often they even aiding with funds. They pay for the spare energy that solar panels produced when they load it back to the circuit. In Spain it is the other way around, and if a company produce more energy with their solar panels than what they would use, they have to pay a price for every spare Kwh. Fortunately these regulation cannot hold back most of the

producer companies like Moyca and Blancasol. Both of them installed solar panels to produce energy for the plantation where there will be no surplus of energy. They use solar energy to powering their water pumps, warehouses for example.

Today most of the power grids come in a centralized form, which is an inefficient way of power distribution and we end up with unused surplus. In consideration there are many who living without stable energy source we can consider any surplus is a tremendous waste. There would be a solution, which is blockchain, based, a peer-to-peer energy system, which would be able to reduce the need of long distance energy transmission, therefore there would be a decrease in the energy loss on the way. It could also help to solve the way we store energy today (Datafloq.com, 2018).

Sustaining the environment

Sustaining the environment not only means to reduce electricity and water consumption, but to eliminate chemical usage and find alternative ways to keep the plantation healthy. The efforts to this cause start with collaboration between seed suppliers and producers. The seed and plant suppliers are researching and pushing for a new type of plant to be more resistant to the elements, and producers are finding new ways to protect them. Our example is Moyca and Blancasol. They are funding alternative researches in the terms of reducing chemicals. They both using plants that are more resistant to insects, therefore less pesticides needed. They also use other type of bugs to eat harmful insects. Blancasol started to use a new method, they use extractions from other plants to keep the grapes safe and healthy, however this new way is still in its premature phase, it raises the question; how sustainable is this method? They are reducing chemicals, but on the other hand they need to grow the plants they pull the extract from, which also requires land and watering. At this state we cannot conclude on this question.

Environment alliances

Fraud and manipulation of data can be a problem when we talk about environment treaties and alliances. It might be difficult to track the data governments or corporations are providing, if they are acting on the agreed terms as promised. Since the technology's main attribute is transparency it would allow to track important data. Therefore it can discourage the governments and companies from deceive their proposals and reports or falsifying data, because it is impossible to delete a record with blockchain.

Packaging and food waste

Today Europe alone generates about 79 million tons of waste only from packaging, which out of about 54% is recycled and reused waste (Ec.europa.eu, 2010). We can consider this amount of recycling a great step toward sustainability, but there is still more we could do.

But to understand what packaging waste is, we have to differentiate it. There is primary packaging, what we consider being what the consumers see on the shelves and takes home with him. The other version we call secondary packaging which we can translate to larger cases, card boxes, crates that are used to store larger quantities of the goods. Our findings indicate that within the industry and along the supply chain there are different methods to control waste. Many of the companies we investigated (Moyca, Dansk supermarket) see a vital part to build in environmental regulations into their policy. This includes recycling, composting.

But we are still facing a very complex challenge. First of all packaging is not only for aesthetics, but it plays a major role avoiding food spoilage and maximizing product life cycle, which is obviously one of the key factors avoiding food waste. And for second unfortunately these packaging's creating most of the waste within the industry. Therefore it is a difficult question to give an exact answer for, what should it be reduced.

Food waste is in correlation with income, countries and communities with higher income are wasting more food than the ones with a lower income. This waste differentiation was estimated about 35-60% more (Bender, 1994). A possible solution

to this problem lies within educating the consumer to purchase less amount of food or encouraging recycle. There are certain startups aiming for this problem, like Too Good To Go or Wefood, which are aiming to recycle still edible food.

Carbon emission and food miles

Food miles means the distance of a product from the farms its originates until it arrives to our plate. It also means how much carbon footprint occurred in each stage of production along the supply chain.

Carbon emission occurs during the process of growing, farming, transporting, storing and every activity that can leave a carbon footprint causing climate change. It is usually defined as a total greenhouse gas emission caused by an activity, company etc. In our case food transportation is one of the main environmental issues that needs to be solved. In our supply chain transportation sector is considered to be one of main consumer of energy (oil), and therefore it could be blamed for around 10% of the total carbon emission (Wilson, 2017.)

Presently IBM and Energy Blockchain Labs in China are collaborating to establish a blockchain based marketplace for trading carbon assets. The objective of this program is to create a public ledger of every carbon asset is recorded, therefore it would offer transparency (Datafloq.com, 2017).

In addition along our supply chain producers / growers think themselves as CO2 reducers, because their plants are providing oxygen. They are aware that their activities are not creating an equilibrium state, and there is still a lot to do in terms of reduction.

Improper handling of produce

Improper handling of the product could easily cause some losses. These losses could occur for example from temperature loss during transportation or storage. If there is debate and accusations over circumstances, it is hard to prove whose fault it really is. The transporter (driver) is not able to see the uploading conditions, more often they even have no knowledge about the uploaded product. During transportation A to B there is no way to them to alternate the temperature, therefore it would be clear

who is the one to blame. Another example is when they handle different products as one, meaning they store grapes, apples, cucumbers etc together. These products have different temperature needs therefore some of them will be ruined. Moyca for example send employees to storehouses, supermarkets to make sure their product is handled as instructed. The issues originating from temperature control could be supervised and solved by blockchain, meaning expenses and losses would be reduced.

With blockchain's tracking and recording features it would be relatively easy to determine these error points, and resolve who is to blame.

Social problems in this section

Unfortunately social sustainability is the often overlooked half of sustainable entrepreneurship. But in order to solve the challenges that we adress in this matter it is not enough to only focus on the environment. Social sustainability is the process of creating, for example, sustainable work environments, treating men and women with equal rights, giving them equal payment for the same work. It also means the companies try to preserve and create livable communities around themselves. Companies are now making partnerships with NGOs and organizations to support social sustainability, and to better their own transparency by making the supply chain more ethical. Some of these activities could be benefit from implementing blockchain, examples of these are detailed below;

Social charity

When we or a company makes donations to an charity or to an NGO established for this purpose, it can be very difficult later on to track where the money goes and how it was spent. Unfortunately transparency is not a thing we have plenty of in every segment of the business world. Corruption and bureaucracy are still a common enemy of charities.

With blockchain it can be insured that the money individuals donate to a specific cause will not be the victim of corruption or fraud. To be more specific blockchain based money could be transferred automatically to the right account; or go

directly to the right cause. Blockchain integrated funds don't even require bank accounts for transfers. This is the most likely answer to this social challenge, since it solves the problem for those people who are lack of a banking infrastructure. This makes it possible to be even more specific and transfer the fund directly to the people in need, without first putting the funds through overly complex processes.

Workforce

UN global sees human rights as the foundation of social sustainability, treating workforce equally and fairly shouldn't be a discussion but unfortunately it is.

Fortunately we can bring up very good examples in our supply chain. One of our example is Blancasol who is providing fair and safe work environment to all of its employees. It also treat their staff with equality, the same rights apply for men and women, for the same type and amount of work they get equal wages. The nature of this industry can create some unbalance in distributing work, since on the fields work is requiring more power, stamina, therefore it is generally more suited for men. They resolve this unbalance when they are hiring for packaging the goods. Blancasol also strives to hire locals, and is providing work all year round. Unlike their competitor Moyca, whos production is seasonally and therefore they only hire for the season, this leaves their workers without a stable job.

Supply chain in Europe

The European supply chain in this industry is not that complicated as most of us would believe. As we found out along our interviews; with the companies in the chain (Moyca, Blancasol, Dansk Supermarked); most of the business relationships are based on an at least a decade old partnership. Also the regulations towards supply chain and industry sustainability are strictly set by the government.

But consumers are also becoming more aware of sustainability and collecting knowledge about its aspects, they demand more transparency than the current supply chain can offer. This eventually combined with governmental austerities will push the current model towards a new one. So it is a priority for corporations to look for

another solution which could satisfy these demands. Blockchain integrated solutions can assure consumers that access is granted by the company into their supply chain and its unaltered information.

Sustainable supply chain with blockchain in the industry

In this section we will take a look at the differences in the supply chain that we are focusing on and we will see if implementing Blockchain would make a difference. Would it create more transparency and traceability than what is existing right now? We base this section on our theory that most of the people would purchase ethically made products and the key to be sustainable in future is working in conjunction with traceability and transparency. Furthermore we will investigate every actor within our supply chain and see if it a relevant solution for them to use blockchain, what can it do for them, or how they can be transparent and sustainable in an other way.

Supply chains are connecting two ends of a market, and channel and share information, products, money all the way. Their efficiency could easily affect the connected companies performance in revenues as well as in judgement from the consumers. They are continuously exploring new ways and innovative techniques to outsmart their competitors and to fulfill the continuously evolving consumer demands. We might consider that a new era is imminent and linear supply chain in the traditional sense of the word is over. It should give space to a new, digital, always connected dynamic supply chain, which is more like a network. The blockchain infused supply chain will have the potential to transform business sectors and not only share informations but assets and other values. It also holds the potential to remain innovative, regarding the increased pressure put on the supply chain transparency and on sustainability. Beside from the given opportunities, paper based contracts and data stores are still common in the industry resulting decrease in transparency and traceability. For example as we were told on the Dansk Supermarked out of the grape season they often have to reach out for further producers, they might even go for an Indian company, and it is common that they don’t use computers to keep records.

In our case table grapes going through six to eight different hands before it arrives to the shelfs of a supermarket. It would be easy in some cases (not necessarily on the European market, which is one of the most regulated one by law, therefore it is difficult to falsify information) for the supply chain to give false information of the grapes origin, the chemicals that were used, waste management and employee treatment.

Where is blockchain now in the supply chain?

Seed Suppliers

For seed suppliers it would be difficult to implement blockchain into every seed they sell. But sustainability is on their daily agenda they just imagine reaching it with other manners. At the moment seed suppliers are experimenting on new plants. They are combining current seeds to engineer a new breed, which is more sustainable. This new type of grape will be more durable this means it consumes less water. They are also aiming to make these plant more productive, so producers can serve the increased market demands with the same amount of plants or territory.

Growers

Both of the producers in our supply chain find the technology interesting and are aiming to implement blockchain, research has been undertaken. Blancasol would definitely like to see blockchain installed and has already made moves towards research. They believe to achieve sustainability they need to do more, in spite of the fact they have nothing to hide right now. They think sustainability lies in blockchains safety features, and how it provides data through transparency and traceability. They also believe they will gain a competitive edge if they move first, and will be considered a company who is not afraid of change, and it is focusing on the future. However, they think this should be shared and should be researched and implemented by collaborating with other companies. Pedro Robles (2018. April 6., Personal Interview) told us they don't consider a future for those companies who do not merge with transparency and aim for a sustainable business model.

Moyca thinks with blockchain they would be able to track the loss it occurs in the warehouses during storage after harvest, which is approximately 10% of total produce. They also consider to creating internal value by knowing they are good enough to live up to the current standards.

Transporters

The Transport section is the one who would get the most out of implementing blockchain. They see the benefits of this technology as an insurance, because right now there is no sure way to do it. They are often getting blamed if the product is not arriving in the expected conditions. However they (drivers) cannot control these conditions for example the temperature once its set, but they cannot prove otherwise. This generates distrust between the producer, transporter, distributor triangle, but mostly between distributor and transporter, since for them it is the easiest to blame the "messenger". Integrating blockchain would solve this problem. It would also solve some social problems. Current certified transporters challenged by cheaper Eastern European companies, which are focusing on cost reduction by paying for social security and other benefits only in cheaper countries, or using less eco-friendly trucks.

Distributors

This sector has the responsibility to build partnerships with licensed, certified contractors with accountability. In these terms it would make sense for them to implement blockchain, yet they said during the interview they are not excluding the idea, but they don't see the point. They believe that the European market is regulated enough provide the necessary transparency and traceability to their imported products. Everyone who wishes to enter the European market has to have a certificate uploaded to a GlobalGap named online platform. It is basically a database with every provider on the market, and it makes very easy to track producers and products back to its origins. Jakob Skanning (2018. March 12., Personal Interview) consider that GlobalGap would need some sort of an upgrade. Maybe to make it more easily accessible to consumers and make it a bit simpler to use, therefore it would provide more transparency than the current system.

Retailers

During our interview with Dansk Supermarked we found out that they heard very little about blockchain, they are also very sceptic about it. We mentioned before that the European supply chain is based on long term relationships and it is strictly regulated by law. Therefore they don't really see the benefits in blockchain.

They are only compliant for demands from the consumer side, but only then if it is demanded from the majority of their consumers. So they won't implement any blockchain based technology into their operations, until the consumer side demand it. Thomas Feld (2018. April 20., Personal Interview) told us that they rather see the future in the "pressure-built trust" that consumers put on the producers of the brands.

Value chain with blockchain

Some say value is where the price is, but this is not entirely true. Value chain are more complicated that this and many factors are generating real value. We have discussed some of these aspects when we presented the theory. But blockchain can change how traditional value chains are perceived by the consumers for example and also add and increase the value.

Sustainable Business model with blockchain

Some say that blockchain is the most innovative technology so far and it is the future while others are still sceptical and think its just a trend. Either way it seems that the possibilities with blockchain are endless. But to use it the right way it requires proper implementation and a new business model. We believe the main problem with installing blockchain is that companies are still targeting investors who are already involved in the business, but they more likely stop realizing its benefits beyond Bitcoin (Entrepreneur Today, 2017). So we think they should approach entrepreneurs with ideas who can see the benefits of the technology and doesn't stop at revenue and are able to exploring.

The entrepreneurs should get aggressive on innovation, and create new platforms for supply chains. The new business model would provide more efficient data collection and analysis, which creates an open book scheme that leads to transparency and gains trust. Whoever in the agriculture industry trust the technology and implements it first will gain a first mover competitive edge. Also these corporations will have the opportunity to help develop the regulations with the authorities, and architecture the technology how it function the best for them. Hopefully these companies will motivate others to do the same and others to buy in to the technology because they share the same vision about sustainability and not because they afraid to be left out.

However the implementation still holds some concerns and corporations may think twice before integrating blockchain. One of the concern lies within the system's openness and therefore the competitor will be able to see each other's supply chain details, like the volume of product moving, these concerns however can be mitigated by encryption. Another concern is that a third party could own the supply chain data. Security of the chain would be another concern, using the public distributed ledger system might expose the chain to cyber-attack. Of course these are just mere speculations, since no one within the industry fully integrated blockchain.

Benefits to the stakeholders

Blockchain holds the potential to tear down barriers which could lead to more efficiency with handling the supply chain in Europe. As traceability advances and nears acceptable standards, a greater impact on society and corporate life will be noticeable. Blockchain could create a vast amount of mutual benefit like credibility, accountability among the corporations. It would also create a commonly owned uniformal data platform standard, which could provide more efficiency at a lower cost.

Results

The economic development of supply chains has adopted numerous techniques, which have been harmful for the environment and for society. WIth a growing population leading to a growing need for more consumption combined without noticing the environmental barriers. But in the past ten years the table has turned. Being sustainable is not a choice anymore, but a fundamental standard that entrepreneurs should guide into the necessary norms.

Sustainability in a large scale is mostly about the people and their well-being in the context of equity and in the context of how well nature and society is balanced around them. But as we see this balance could be extremely sensitive and it is threatened by social and economic stability. These factors should carry equal weight in a corporation's life when it is planning for sustainability. Sustainability is a the ultimate goal and what it needed is for it to be viewed as a "living thing" that is moving along with its indicators used to measure it, like transparency and traceability.

With blockchain technology peer-to-peer framework, much can be done to provide true sustainability for everyone, but there is also a need for further research that would take a more seamless way of approaching transparent food supply chains. Also more work and understanding is needed from all the business partners inside the supply chain, to create a uniform interpretation of what does it mean to be transparent and set an undivided level of transparency, traceability. The successful utilization and adoption of a new technology is difficult, therefore they also need to collaborate and set a standard example to follow within the industry, and create a blockchain based uniformal platform. Right now they have the opportunity to increase value in the supply chain, create high barriers to newcomers and give and challenge to the old partners.

It is also important for them to understand what kind of different meaning sustainability holds for their stakeholders.

Analysis in the light of diffusion of innovation

Satisfying the growing consumer demand and concern for transparency and traceability with a revolutionary technology seems to be the answer. But the status quo of the Spanish table grape supply chain sufficing the Danish market is far from using blockchain. In fact the stakeholders involved are divided on the subject. Some are in the researching phase, exploring options on how and where it could be implemented. Others are waiting for it to be applied through others; given their small size they see it far from possible for them to instigate the creation and implementation of blockchain in the entire supply chain. Then there is a retail chain that is completely unaware and disinterested. And then some stakeholders have already evaluated the possibility of implementing blockchain, weighed the benefits with the risks, and deemed it to be inapplicable.

How can it be that a technology that provides sustainable business practices, increase overall trust within the industry, improves logistics and reduces set backs, and even brings food safety to a new ultimate high in relation to traceability is not yet implemented? We can argue that it is still too early and that the technology still has a long way to go, and a lot to prove for itself before it is trusted within an industry as special as the one we are dealing with. However we have perceived strong opinions, that reside on both of the sides of the spectrum on seeing its benefits or not. So what problematic encounters do blockchain face is the right answer to ask. For it will never be adopted if a firm rejects partaking in this, after all blockchain only function if every partner contributes. If not the integrity of the system fails. This is another reason why implementing blockchain partially leave loopholes and fail to provide the transparency and traceability that it is supposed to provide.

For some it may be unfathomable why this technology does not have everybody onboard, but some industries are built on such different values and human connections, which impedes the benefits of blockchain to seem compelling to all. To fully comprehend where each stakeholder and sector stands in relation to blockchain, and why the innovation have not spread from one to another, we will use Diffusion of Innovation. This theory seeks to explain how, why, and at what rate an innovation spreads. Given blockchains premature state and the unique case we are referring to,

we will mainly focus on why it spreads, or why not. For the rate is beyond our knowledge, we can merely assume, predict and hope for the best. However as with technologies that are revolutionary and disruptive, it can easily take decades before settling itself as the dominant and new way.

It may initially seem confusing why a theory on diffusion is implemented when the innovation at hand has not yet been adopted or diffused in the industry at all. But the focus of this research is not to understand how or where the innovation has diffused to but to focus on the insights that the theory provides to help us grasp the complex condition blockchain is in.

These are:

- What qualities make an innovation spread successfully
- The importance of peer-peer conversations and peer networks
- Understanding the needs of different user segments

(Robinson, 2009)

We mentioned before that when we are referring to blockchain it would not be discussed in technical matters nor the complexity of its implementation. Instead its focus will be on its underlying benefits and how it related to the industry we have at hand.

The first insight of DoI

To start out with, let's delve on the five qualities that determine its success is: relative advantage, Compatibility with existing values and practices, Simplicity and ease of use, Trialability, and Observable results. Each one of these qualities will be discussed differently. For some there will be a division in between those sectors or firms that see the quality and those who don’t, and for other qualities we will have to go one sector at a time, given that each sector have some widely different processes and values which simply cannot be divided into yes and no segments.

The first quality is the Relative Advantage.

The relative advantage of an innovation rotates around how it is perceived to be better than the idea it supersedes. In other words how advantageous would it be to implement blockchain, and do the benefits supersede those of the current system in use. For some these advantages may be economic, prestigious and/or convenience.

As we talked with firms throughout the entire supply chain, it became relatively easy to see a pattern for which sectors saw the advantage for implementing blockchain, and those who didn't.

The sectors that saw the advantage of implementing blockchain were those in the bottom of the supply chain, that is to say, the growers and the carriers. Within the growers, both Moyca and Blancasol, showed large interest in seeing blockchain being implemented. Both stated that they see it as the direction the future of their business is heading. Investigating its potential uses before the market demands it sends a strong image to their clients that their innovativeness is intrinsic and their plans is to create a sustainable advantage through this.

"We calm our clients, since we are showing interest in innovations before they are even thinking about it. It sends a strong message of being a progressive entrepreneurial organization which create strong value to them".

Pedro Robles, Moyca, (2018, April 6). Personal Interview

Even one of the smaller growers interviewed stated that even though the change will start at the bigger organizations it will:

"Make everybody's life easier, create trust and smoothen the entire transaction processes".

Jose Luis Sanchez, Blancasol, (2018, April 6). Personal Interview

The transportation organizations are probably the sector that would benefit the most and therefore see a huge advantage. Currently the carriers have no way of insuring themselves of the pain point where their drivers are prevented to take the

temperature or even monitor what is loaded in their trucks. This eventually comes back to haunt them when the goods arrive at an inferior quality than what the provider or supermarket had expected and paid for. Many of these incidents are due to the fact that the growers deny access to take temperature of the goods before hand because they are not at the optimal temperature, which is a fault of theirs that they try to push on to the carriers. This creates a huge trust gap in between this transaction, which could easily be solved by digitizing the CMR and linking it to the chain, along with the already available traceability system the carriers have.

"*There may be initial costs and setbacks, but you can't put a price on transparency*".

Domingo Ruíz López, Tradomi (2018, April 7). Personal Interview

It is easy to understand why both the growers and carriers see an advantage with blockchain, it would improve the transparency, which is dearly needed in the part of the supply chain, and send a message to its clients that they are firms that focus on the future and wish to sustain their competitive position. However one thing that must be noted, when interviewing the firms in these sectors, they were the firm who were the least knowledgeable on the technology, and so far still connect blockchain to Bitcoin. It is easy to see the advantage of a technology when the benefits are presented, but without emerging them into what it actually pertains to the business, it is hard to conclude that their position on relative advantage will be definite.

The companies, who do not see an advantage over the current processes and systems applied, are the remaining firms in the supply chain. While we did not manage to speak to the seed suppliers, it is fair to assume that their part within a decentralized connected chain would be minimal as each seed or plant would be hard to grant a serial number. More so when each plant have offspring's every season. However knowing that the institutions behind this process are scientific and lab oriented, we conclude that they would have all the relevant logs of treatment and registration of the creation of each seed and plant. On the contrary, it is also safe to believe that given that there are only a few top seed and plant suppliers, and many are owned cooperatively by growers, the transparency and traceability is only of

importance to the growers, which most likely already partially own the firm. And as mentioned, if run by them, there is less interest for them to invest resources and time into implementing a system, which may seem unnecessary to them.

The distributors were those who were most informed and knowledgeable on the technology and uses of blockchain. And to our surprise this positioned them on the skeptical side of the argument. Providers such as Total Produce Nordic have already had their technical team and managers research the opportunities, and eventually concluded that within the European market the only application and advantage from using blockchain would be in the organic sector. And even though organic fruit may not be traced back to its origins without blockchain, a quick test could determine if there is any active matter in the produce and through this, ensure it is organic

The retailers were the most shocking sector. Logically thinking, it would make sense to assume blockchain would come from the top of the chain. The consumer demands affect the retailers directly and it is the retailers that have to respond to this change in consumer behavior. Along with this, the retailers are also the furthest away for the origin of the product in the supply chain, which means they are to gain the most from a the transparency and traceability that blockchain offers. But when we asked Thomas Feld, who represents 3 of the biggest supermarket chains in Denmark, about his thoughts on blockchain and if there were any future plans to implement it, his response was:

"I have to be honest with you, i haven't heard about blockchain, neither within the business or personally, so i can't express any thoughts on it".

Thomas Feld, Dansk Supermarked (2018, April 20). Personal Interview

The advantage is hard to determine for an entire supply chain. Increased transparency and traceability is an over all win for all the players involved, and satisfies the customers demands, but does it supersede the current system in place? That question comes with two answers. For the early stages of the table grapes history, the growers and transporters see only added value, but are perhaps blinded by what it entails and affects the business. For the rest, the answer is a dubious no. For

within Europe, an industry that moves between two countries markets, the supply is in such big quantities that the relationship and trust is the prime assurance that the stakeholders rely on. If this trust is broken then a lengthy and lucrative contract will be annulled and this would not only ruin the prospective business in the short term, but also ruin the chances of starting new business relationship as no one risk doing business with frauds.

Compatibility with existing values and practices.

Innovation´s compatibility is relatively easy to analyze in the fresh produce supply chain industry. However each link in the chain has different values and practices, which is why under this quality, we must go sector by sector in order to see its feasibility. As the theory states the innovation must be compatible with a firms *sociocultural values and beliefs, previously introduced ideas, or client needs for innovation*. We will now proceed to explore blockchains compatibility within this supply chain.

First and foremost, the seed and plant suppliers are at the top of the supply chain, however some might argue the chain does not start until there is a harvestable fruit, as this is the produce. We will include assumptions of the seed and plant suppliers when possible but will for the majority of the analysis exclude them from the research. For example, blockchains compatibility with existing practices is relatively possible, as the documentation is fairly available for each every seed and plants, however each plant will produce table grapes for many seasons to come. So while it could be implemented, its compatibility falls short of the technology and is not as viable given that for the majority of users the supply chain starts with the growers.

The growers, carriers, distributors and retailers, all have an internal traceability scheme, servers with transactions, and digitized most of the paperwork. Along with this research, every single interviewee have stated that transparency is value they want to offer their clients and is within their business practices. So it is fair to say that what blockchain offers, such as transparency and traceability, falls well within the entire industry´s value and beliefs. And something that is of utmost

importance throughout the entire supply chain is food safety, which is also one of the main demands of the clients. Their demand for information is what sparked the entire research and is one of the biggest benefits blockchain provides, so it fits the description of how compatible blockchain is within this industry.

However smaller growers, transportation firms, and small shops, who do not have a traceability scheme, fall outside this assumption. Small growers who don't store orders, invoices and other valuable day to day information on serves, do not have a system or practice that is compatible with blockchain, as it would require adding a technological approach to their operations and practice. The same goes for carriers who still depend on phone calls to locate their trucks, and for small stores who only run their business and don't count on a system or server to account for their products. These firms are still operating on basic measures. However if these firms would update their business practices to be compatible with blockchain, they could ensure more stable future. As Jakob Skanning stated:

"We don't do business with suppliers who cannot state their products history, nor carriers who are unaware where our goods would be, this is unprofessional and is just not something we wish to deal with. We do not wish our clients to be involved in the problems this would incur"
Henrik Kaalhauge, Total Produce Sourcing Spain (2018 March 16) Personal interview

The simplicity and ease of use

The complexity, or simplicity and ease of use is a quality that is tough to make assumptions on. The answer to this can be very individual and we therefore take an outsider's perspective to answer this objectively.

While blockchain is hyped within industries of every trait, it is still so early in its acceptance phase that it is hard to determine even if it will be accepted. However as mentioned, most of the bigger organizations have digitized most of their operations and transactions which eases the averseness on technology. But the process of implementation will be gradual, lengthy and most likely filled with problems that over time will be handled through trial and error. The upside to blockchain is that it would be a universal system that standardized all the transactions and layout for all the

partners involved. A universal system would over time be easier to accept, as adopting it would mean learning a skill that grants entrance to a network with all the already active players. This is also why the first movers and implementers have the advantageous point, because they get to set the standard, and chose what aspects are important and how it will work. That is not to say that the system will overrule important features that are unique to a sector outside of their domain. But being on the creative team from the start carries a big advantage, and also assures that understanding the system is taken on from the early beginning.

One of the carrier companies, Tradomi, have already created a prototype software where the drivers use an app to check off all the necessary information required to state in the CMR. This is essentially the same process that would be implemented through blockchain, and if the organizations already have a technological approach to their business operations, it would be fair to believe that the acceptance would be relatively fast. Those who don't fall under this group would not accept it as it falls too far away from the current practices, which as we discovered are fine with them so far.

The small stores and shops in Denmark are mostly analog, requiring cero need of technology. So if blockchain was to be implemented, their part would be minimal, the goods would have to come with a qr code or similar label that states all the previous involved partners in the supply chain but exclude them.

However, understanding the technology is far from easy. Most of our interviewees barely understand the underlying technology but only the benefits. Even distributors, who have the biggest logistical nightmare and would highly benefit from this, see it as something of the future.

"As far as I know, blockchain is some type of sci-fi technology. I get that it can solve a lot of problems but most of us in the industry are clueless on how it all works"

Henrik Kaalhauge, Total Produce Sourcing Spain (2018 March 16) Personal Interview

The quality of trialability

We certainly see trialability as the one of the main qualities of blockchain. This is easily observable when taking a look on where blockchain is being implemented. It started out as a worldwide payment system, and is now used in industries such as health care, music, human resources (Hayzlett, 2018), and also the industry we have at hand. However the produce corporations that are implementing blockchain are large multinational organizations who are vertically integrated and have extensive resources to trial this technology.

An industry such as the fresh produce exportation, where the suppliers of a single produce are multitudinous, is much more complex. Distributors have their fixed suppliers whom they have lengthy contracts with are bound to stick to them, however a bad season can cause them to have to look outside their portfolio, and this is where smaller suppliers come in the picture. And these suppliers as mentioned previously are rarely as advanced and are therefore not used for supplying the Danish market.

But this doesn't necessarily impede blockchain to be beneficial to the entire system, but the contrary. The fact that blockchain is still perceived as an everything or nothing technology makes it less attractive. For when all sectors think that blockchain is going to include smart contracts, allow all players to see the transactions and movements, and reveal important firm information, it is understandable that they are pushed back. But one option would be to solely start out with the blockchain technology just to trace the goods. This brings food safety and creates mutual accountability without including all the other applications. This technology is already tested and suggested by Deloitte (2017) and it proposes a simple system that solely focuses on providing a tracking network of goods. This would not allow any other partners to see movement of how much, prices, or two who. Simply providing a safer and more fail proof traceability system

The trialability and experimentation opportunities with blockchain are unlimited, and this is why it has soared within the past few years in almost all industries. But when firms only see the big players investing in a fully integrated blockchain system, it scares away the smaller players.

"It may make sense for big corporations to implement blockchain as they can constantly apply more resources for it to work, plus their suppliers and contact list most likely live or survive by doing business with them. However when it comes to us who have so many suppliers and seasons are unpredictable, it is impossible to see how the implementation would work, bring all the interested parties onboard and how we could build on it".

Jakob Skanning, Total Produce Nordic (2018, March 12). Personal Interview

Observable results as an indicator quality

This is probably the hardest to determine as of yet. As we have mentioned, blockchain is trialed in every possible industry, however the results are not yet achieved nor perceived. So far, the only prospects we have, are assumptions. Taking Mærsk as an example, it would seem that implementing blockchain in their logistical mayhem of an industry would be a huge benefit, providing the traceability necessary and ease the entire industry tenfold. However these are just speculations, and just as we initially thought that blockchain would revolutionize the food industry, we cannot conclude anything yet. But it is safe to say that we are not the only ones who think this. Every grower and transportation firm showed a large amount of enthusiasm and optimism of how blockchain would result in a much more smooth and transparent supply chain.

"We would be the main beneficiaries, we would love to see blockchain being implemented, after all it would make our lives so much easier, and reduce most of our sectors problems right away".

Cristina Garcia, Garcia Carrasco (2018, April 7). Personal Interview

These five qualities are extremely valuable as an evaluation of the innovation within this industry. As we have seen so far, for some of the qualities all the modern and big organizations see the benefit and applicability of blockchain, for other they are split, and some it is purely assumptions. However this has provided us with a clearer individual opinion of each firm and sector, which in turn show the weaknesses of both the technology, but also the industry. And these weaknesses may be the ones that impede blockchain to succeed.

The Second insight of DoI

An innovation's acceptance depends just as much its added value and the qualities we just mentioned, as it does on peer-to-peer conversations, recommendations and recognition from early adopters. Blockchain is so hyped that it is almost impossible any tech savvy individual and organization have not heard of it and given it a thought. This hype, however, stems mainly from the cryptocurrency boom we have experienced over the past five years.

The fresh produce industry and supply chain is not one where cryptocurrencies have made their way into, and we believe we are very far from this ever happening. So when we mentioned blockchain to our interviewees and deviated away from Bitcoin, a wide array of responses were received, ranging from cluelessness to researching more and more on it.

Surely enough, some partners throughout supply chain are aware of a new technology on the horizon and know that it is best to be ahead of the rest of the industry. Both to sustain a competitive advantage and to signal to their clients that being an innovative firm is asserting the position in the future. Suppliers such as Moyca already have their top management involved in research for the possibilities. Pedro stated, that they are currently researching all the options, where and how this technology could be implemented.

"By doing this we calm our clients, since we are show an interest before they even know about it. This sends a strong message of being a progressive entrepreneurial organization which create strong value to them"

Pedro Robles, Moyca, (2018, April 6)

But this only confirms that any peer network on the topic of blockchain is contained within each firm, and any knowledge sharing outside this, is non-existent. This only adds value to the corporation clients, and if there are no signs that blockchain might become the market standard, it won't stand a chance. Other players such as Total Produce Nordic have also had their technical department in over this. But once again, only shared their thought within the firm, impeding a constructive dialogue of members within the supply chain.

"I haven't even heard about blockchain from within the company".

Thomas Feld, Dansk Supermarked (2018, April 20)

Marketing methods and media stories are almost countless, but initially only on the risky, yet lucrative, business that cryptocurrencies have turned out to be. This has therefore not informed, or reassured, and individuals or firm on the technology behind blockchain. Case studies and the multiple applications of blockchain started to appear within the past two years. Mærsks collaboration with IBM to implement blockchain did not go by silently, and was for many the first big news of a big multinational conglomerate taking the first step to adopt the technology. For many, this was the catalyzer, however the news of corporations following suit, have mainly come from big multinationals and banks. This sends the message that with deep pockets, errors can be made and eventually these firms will set the standard of how it will be implemented across their industries. We learned that this is for most firms within the fresh produce supply chain, an example that is without reach within their rational thinking.

"These examples are not applicable nor a trustworthy incident for this business. Why are they even doing this if they are so vertically integrated... When the suppliers cannot be counted on one or two hands, it is hard to imagine to put together a linked chain for all"

Jakob Skanning, Total Produce Nordic, (2018, March 12)

So where does blockchain stand in relation to peer networks and across company and sector knowledge sharing? Well, it doesn't stand anywhere because so far we only found one grower (Moyca) and one distributor (Total Produce Nordic) that have even heard of its potential outside cryptocurrencies. And the media have only scared away the smaller players. When companies such as Mærsk, Alibaba, and Carrefour are the early adopters, a message is sent to the smaller enterprises that deep pockets, large margins for errors, time, and leverage is required in order to take the first step into testing out blockchain. This is also very problematic because the early adopters and investors will eventually be the entities that will set the standard and shape how blockchain will be implemented in their industry (Deloitte, 2017).

So while blockchain is appearing to be a technology only for the big players so far, it should not be underestimated what the opportunities are within smaller supply chains with more players. It is understandable that none of the firms that we have interviewed are willing to invest solely in implementing blockchain throughout the entire supply chain. However all but Dansk Supermarked stated that they were willing to collaborate with other players to successfully implement blockchain. And once the majority of an industry accept and implement a technology, eventually the rest will join.

"If everyone starts implementing it, more people will start trusting the system. And if not, it might just become the new norm, so we will have to adapt either way".

Pedro Robles, Moyca, (2018, April 6)

If this thought was shared with each and everyone, it is safe to say that the corporations would no longer feel too small to have an impact on its implementation. And when all the partners are involved, a strong community is created, and it is there where peer networks thrive, and conversations will soon spread to every corner of the industry. Rapidly creating a trustworthy social system around blockchain in the fresh produce industry.

Third insight of DoI

Even though none of our interviewees, and any in the industry for that matter, have shown intent to adopt blockchain in the near future, it is far from futile to employ diffusion of innovation and locate where each sector would be within the segments of propensity to adopt blockchain. For it is not a mechanism to see how a firm can move closer to the early adopters, but how handle and effectively determine the best ways each firm can operate within their given segment.

Blockchain is already conceived and is growing in its maturity. But rapid growth and awareness does not mean it is market ready. Within the fresh produce industry it is safe to say it is still too premature to be considered as a viable solution to growing concerns. However the growing coverage of the technology make individuals outside the industry believe it is the future that should be in the present.

We will skip the *innovator* segment, as there are none of these within the supply chain we have at hand in relation to blockchain. The technology behind it was created 10 years ago and openly sourced. As it is with innovations that are applicable in almost all industries, they were rarely created with the intention to take over the world. This notion is apprehended afterwards.

The *early adopters* are what we have witnessed the big multinational corporations to be. Their focus on sustaining their position is always the backbone to most of their strategies. But none of the sectors or firms we have interviewed and analyzed fit this category yet. Early adopters are on the lookout and alert for new innovations react as soon as the benefits are apparent. Moyca have taken the initial interest and are researching the options, and if they chose to take a step further with this, then it is safe to say they will be one of the first growers ever to implement blockchain. Pushing the industry forward also benefits the firm doing so as they most likely will set the standard of the future.

The seed and plant suppliers are technically innovators, as they push for more sustainable and economically viable seeds. Their employees are scientist pushing the industry forward and making the future problems manageable. However as we are analyzing each sector in relation to their stance on blockchain, we can only assume that the seed suppliers will most likely fall under the early majority or the late majority. Since most of the big seed and plant supplying and researching organizations are co-owned by growers, it is fair to assume that as the growers adopt some form of blockchain technology, so will they. It will be much harder, as their product will provide seasons worth of product. It will be to a much more simple extent, where the information provided will be based on who is supplying the seeds and what process carried out in order to reach this new variation. In case of organic seeds, more pressure will be focused at how it was conceived and so forth.

We can confirm that no entity we interviewed in the table grape supply chain is willing to invest right away and be the innovating leader. Being an early adapter in a complex supply chain like this does emit any huge benefit signs to the interested parties. For if a supplier, carrier, or distributor started to react to blockchains hype and

invested in this, it is still necessary to involve the remaining sectors within the supply chain. And if not done properly and an exclusive approach in the process of creation, evolution and maintenance is taken, none of the remaining interested parties will adopt the technology.

From this we can deduce that even if there were an early adopter within this industry, it would not necessarily provide an advantageous position. But more of a parental position, for it would involve including all of the sectors and corporations to the drawing table. This is a much easier process when the bargaining power is high and the chain itself depends highly on this one corporation. This is the case with Carrefour and Wal-Mart, as their size and reputation delegate them a higher power.

The entire supply chain would most likely fall under the segment following the segment the implementer of blockchain fall under. While all stakeholders show willingness to cooperate, and if it becomes the norm to adapt to it, none show the intent to initiate it. This would entail having to study the entire supply chain and manage the expectations and working of it, within sectors that are unknown to the entity.

The early adopter of blockchain would therefore have to be a third party entity, which already was deeply rooted within the supply chain, culture and integrity of all. The ideal instigator of blockchain would be a certifying body, with a deep relation to the entire value chain. With deep knowledge on the processes and operations of each link and a reputation and power that supersedes the big client, it is much more easier to see them fit as the early adopter which would engage all partners.

This way the company that starts to focus on this can solely focus on this while the industry can keep on functioning as a machine, as it must keep on rolling. Handing over the tedious process of ironing out the chinks and mishaps that occur in the initial stages of implementing a new technology and innovation. We will develop this further with a concrete example towards the end of this analysis

Our findings amount to that within the supply chain, all participants are hesitant. The suppliers are at the bottom of the chain and are therefore preoccupied in assuring their clients that the table grapes they are buying are the best. If a blockchain

is the way to provide a better and more trustworthy relationship, then the suppliers are more than willing to adopt the technology. But creating the blockchain from the bottom of the chain is rarely heard of, and would prove to have many difficulties as growers in Spain are not as preoccupied with what happens to the product once it is transported further on, as vice versa. This is because their business transaction is already carried out and the next step for them is to sell the next batch and deliver the next order.

We therefore conclude that if the technology were to be created from a sector within the supply chain, it would come from the top sector. This would be the retailers or the distributors. For they have the responsibility to assure their clients that the produce is what it states to be, and it is safe for all. But Total Produce Nordic stated that even from the top management in Ireland there are no apparent benefits to be gained.

"It is not something that has come up in our company. We provide the trust and comfort to our customers by placing strict and high demands to all of our suppliers, and so far we haven't heard any claims rejecting our practices."

Thomas Feld, Dansk Supermarked (2018, April 20). Personal Interview

Results

It may come to a surprise what the recent findings uncovered, but what we see as the real surprise, is that blockchain has received a monumental hype without having taken all the industries and aspects of these in consideration.

The qualities of blockchain have suffocated the media outlets and created a movement that is based on praising blockchain. But these qualities have not been thought of in relation to every industry. There are clearly some small businesses where blockchain is irrelevant. But in complex supply chains, blockchain is set to thrive and make lives easier. However this is not the case for the tale grape industry.'

Within Europe, there are strict requirements where the GlobalG.A.P. Is the minimum. This means that all entities involved in agricultural practices and transporting the goods are certified in order to supply the Danish market. The distributors ensure their suppliers possess this certification before writing any

contracts. Several certification bodies therefore audit the table grape suppliers and if one of these certifications is missing, business halts. The severity of this, is already assuring the distributors and retailers that the consequences of committing fraud is well known. This is why the distributors and retailers rely on mutual accountability and only see blockchain as a necessity to tackle the current issues in Denmark when handling suppliers from outside of Europe.

"Blockchain can be relevant in the organic market here in Europe, but then again this can be mediated through a quick lab test. We mainly see blockchain as a remedy to control suppliers from India and Turkey, the corruption and information manipulation can easily go unnoticed. There are few consequences, besides the ones we impose when caught"

Stefano Minischetti, Total Produce Nordic (2018, April 27). Personal Interview

But blockchain is compatible with all the current practices. All the sectors have internal traceability schemes that are digital and store information on a server. These practices are all done to provide traceability and safety within each of their sector and to their clients, adding value through out the chain. So the change would essentially just be an improvement of their current system. Blockchain links up with all the values that are present within the industry. After all none of the interviewees showed disinterest in improving their safety and transparency, so it is trivial why it is not seen as the next step in innovating the industry.

Another quality of blockchain is that its simplicity of use is relative. Small growers and shop owners think it is unnecessary digitization of their daily business, but big enterprises that carry out massive orders see it as a way of making their lives easier. It improves the logistics and creates value throughout the entire chain. Its simplicity of use is purely up to the creators. Which is why, being on the developing team is paramount in order to include your aspects and important features. This relates to the trialability of the technology as well. For it could be implemented in small steps, while the acceptance becomes widespread new possible uses and applications could be developed and tested.

Blockchain is taken for all it is, and not for what it could be, and just some of what it is. The technology can to some extent scare managers away as a completely decentralized server is a big step and allow a lot of partners and competitors seeing all the business transactions.

"It feels as if we would go from having comfortable clothes on, to being completely naked amongst all our business partners, eventually we would all accommodate to the feeling, but it is a big step that can push some of the stakeholders away."

Henrik Kaalhauge, Total Produce Sourcing Spain (2018, March 16)

The sense of implementing blockchain fully and reaching out for all of its benefits is delusional in this industry. However an initial integration of one of the transactions could ease the acceptance rate and overall position on its benefits. Instead of writing up smart contracts, involving all the certificating bodies, and investing in a technological upgrade to handle all the transactions, a universal traceability scheme could be the first step.

All the corporations have their own traceability schemes in order to provide logistics to themselves and value to their customers. These schemes could be linked together to create a trace chain. It would enable the tracking and tracing of all finished goods, and therefore provide a high level of trust, ensure no alteration occurred, and upgrade the food safety measures (Deloitte, 2017). Small gradual steps towards implementing blockchain have a much higher probability of succeeding.

The peer network within this supply chain is barely existent. When asked on whether the firm has collaborated with other entities in order to reach their current traceability scheme or improve their sector in general, all replied no. No collaborative mentality is visible, and this makes it very hard to innovations to spread. And when an innovation is reached and implemented, it also provides a sustainable advantage, which is rarely openly shared. The upside to this is that the advantage of blockchain is not achieved without involving all the interested parties.

What is missing from the movement to start within the industry is a firm taking the initial move. Once an initiative investment and outreach to all the involved partners is done, a signal of trust is spread. What we mean is that once a firm send the message that they are willing to take the risk the remaining organizations perceive this a trusting move.

But so far none of the companies are willing to take this step. Some are not even interested in blockchains application. This results in a stagnant industry that will eventually just wait around until a new standard is set in place through other industries. Non-innovative industries hardly ever thrive, but some of these sectors in this industry are not set to thrive on innovation. For as we mentioned early on, this industry is based on values such as trusting customer or client through a verbal agreement, long term business relationships, and gut feeling. These values are hard to digitize and apply to blockchain. And it is therefore that none of the firms in the upper part of the supply chain have bothered taken the decisive step to implement blockchain.

The nature of the industry is hardly the root cause of blockchains failure in the fresh produce industry. Because we have so far only covered organizations who are directly involved in the supply chain. We saw similarities throughout the entire research process that linked them all to the global G.A.P certification body. A third party entity, that know the operations and processes of every single player, is much better informed and have better conception of the big picture. A certification body also have the upper hand when dealing with each single entity, for their certification is what deems them apt for business or not.

GlobalG.A.P already have a traceability scheme in place, every single player has a serial number and each order is also given a tracking number. Certifying entities are the overlooking organizations whose main job is assuring the practices and standards of the industry are set as high as possible. This makes them the ideal candidate to initiate the blockchain movement. However if some of the sectors do not see this as necessary because Global G.A.P already provides similar benefits, it just might be that the technology of blockchain won't succeed after all. But this is not a defeat for the technology; many of its basic uses and possibilities can be implemented

in the global gap model. However the key issue here, is that this is still not decentralized and if global gap were to be fraudulent or succumb to a cyber attack, the focus will return to blockchain to create a completely safe system.

8. Conclusion

Supply chains are hardly anything but complex; this also applies for the table grape industry. It is intricate and even with just a few suppliers it can become a logistical nightmare, and when the lives of the customers could be at stake, it should never be taken lightly. The Spanish table grape sector is relatively young, with around 20-30 years being the average of the biggest and most mature growers. Newcomers are not that regular however due to its extensive resources and high cost entry. This has established a few firms as the leaders and it is them who will push the standards for innovation and sustainability.

But with a government that impedes sustainable practices and customers that just want to see the certification, it is intrinsic motivation that pushes for innovation. So how can the growers, and the entire industry for that matter keep improving in an industry where the word of the manager is valued more than something written?

The answer lies within the timeline and milestones, like EU's 2020 sustainability regulation, we will understand that it is a fundamental requirement. Providing sustainability towards the market, the regulators and the stakeholder, through transparency and traceability, will solve environmental and social challenges that we are currently facing and prevent the ones that haven't occurred yet.

We believe blockchain can make a difference, to support transparency and traceability if it handled the right way. Not only because it has the potential to bring additional pecuniary value to the supply chain, but also adding value that is able to create a sustainable future to everyone.

But it doesn't mean that everyone can implement it the same way or everyone equally understands the potential yet. It is difficult to conclude on a firm outcome, since the technology is only started to spread its wings and we don't have a steady example to lean upon. We have covered different environmental and social aspects that are affecting the industry, and provided different uses of blockchain. This is to prove that sustainability is not only reached in minimizing ones output and resources. But with a connected network, efficiency is achieved and shared knowledge through a peer network will eventually turn to a more aware and conscious industry.

However blockchain is primarily mentioned in relation to connecting the supply chain, but these other purposes are valuable options that could have an effect in pushing the technology to new heights. Which hopefully would create a momentum and higher rate of acceptance.

This would in turn help the blockchain technology proposed in the table grape supply chain. While blockchain can unite a distrusting network of partners, it can also separate them. Those who call for blockchain, or its benefits, are those who are weakest in the supply chain. The transporting sector is always the one that is blamed first, and with little to no leverage to resolve these differences they have to reconcile into it. Therefore this sector is already taking steps to counter the problems they are posed with. Inspired through similar a technology, they are setting out to ensure that their part of the supply chain is always documented and transparent with. If they will resort to a decentralized server and use blockchain is unknown. But if so, it would give them an advantage for already trusting the technology, and if blockchain succeeds as a solution, they could be the mediators and have a much stronger position at the drawing table.

A simple form of blockchain could ease its way into acceptance. TraceChain is a proposition by Deloitte that merely uses the technology for tracing goods. The only purpose of this is to serve as a unified traceability scheme to have a fail proof food safety mechanism in place. Once this is trialed and accepted, the partners involved would be more implement to implement the technology further.

"*These technologies work like this, the more people who start using and accepting it, the quicker the rest will join"*

Pedro Robles, Moyca, (2018, April 6). Personal Interview

So while the sectors that are vulnerable and could benefit from the technology are solving their issues by themselves, the remaining stakeholders focus on simpler

and more manageable solutions. They are well integrated, and without significant benefits, they won't invest in blockchain. Because blockchain in the eyes of the retailers and distributors is a sign that their word does not count for what they say it does. When contracts and relationships are built over the years, through daily contact, business trips and customer care, it is only a sign of distrust if a client or partner suggests implementing blockchain. This ruins a customer relationship and can have large costs to both sides.

Another reason for blockchain inept penetration in the industry is that within Europe, the standards and regulations are so high, and even though there are cases of epidemics, there are no signs of frauds on this market. So the focus is now solely set on quick responses to food safety issues, and this is exercised through internal traceability schemes. With uniform standards and a single entity ensuring these standards are met through certification, a possible alternative appears. For while the big conglomerates implement blockchain to set the standards in their industry, it may seem more natural that within this supply chain, a third party instigates the move towards integrating blockchain.

GlobalG.A.P. is operated by growers and suppliers in a collaborative way already, granting them expertise within fresh produce supply and certifications. Their knowledge within their sector is far more extensive than any individual entity. Along with this GlobalG.A.P already implemented a traceability scheme running across all sectors, which all European growers and distributors already use. Certain signs appeared when connect the dots, GlobalG.A.P. now only have to integrate blockchain into their already existing traceability scheme, granting all users access. Making GlobalG.A.P. servers and traceability equally distributed would unite all entities through a third party with no special interests in any given sector or company. Providing a neutral and honest platform for all to trust, especially since it is already used and trusted by every organization working within Europe

Blockchain, in the eyes of the fresh produce supplier, is the future, but for the retailer is a waste of time. Initially we thought it would be met with open arms, for we only saw the benefits that we applied to our basic knowledge of the industry. We can now conclude that the nature of the business and the human interaction and

relationships of the industry is just as valuable to them, as a certificate. It can be called an antiquated system, which relied on verbal agreements and handshakes, but so far this has only created a mutually trusting environment where breaking this, have detrimental outcomes for the company and for the people involved. With proper implementation and a large acceptance and compliance rate, it may be able to succeed. But Blockchain has a long way to go, and will be met with resistance when the solution questions the integrity of the partners involved.

9. Limitations

During our research we faced certain limitations that impeded us from progressing further with our research. One of the main limitations is that when we started scoping our focus, we ended up settling for the European market. Previous research and food scandals have mainly occurred across continents or in continents where the food standards are low. This of course poses a certain risk that our finding may not be as valuable, nor will the industry have any interest in the technology. This was true to a certain extent, however we deemed that just because the demand is lower than other sectors, it is irrelevant for a technology like blockchain have bigger purposes than just being implemented where it is critically needed.

Another limitation is that we had to focus on a single product. The table grape supply chain is already intrinsic enough, so focusing on more products and different countries was out of our reach. However this would have granted us a more universal opinion on the technology and we could have made assumptions not just based on the Danish and Spanish market. The positive way to see this is that this research can guide future research and lay the foundation for more extensive and all-inclusive research.

This also led us to the next limitation, while still only focusing on one produce, we were still faced with the problem that we could not interview all partners in this supply chain. Travelling to different countries where language and culture barriers are noticeable is only possible when the country is one that is familiar. We

were fortunate enough to have deep connections to Spain, its culture and the entities working there. But if we wanted to create a broader study, focusing on the all year around supply of grapes to Denmark, we would have to contact growers in India, South Africa, and Chile. This would be impossible for a thesis of this size.

Out time was limited with each interviewee, and distance was also a factor that impeded continuous contact. The business itself is a fast paced one, and landing an interview can take up to two weeks to schedule, this caused set back and consumed time more than we had expected. However we were still able to utilize the time given fully, and believe that if there was to be a next interview, and a solution was at hand. A more serious meeting would be scheduled, with various managers and stakeholders within the company. This after all is a study on the supply chain and willingness to adopt a new technology. If the next research project were one that included a solution and was to test it out, a different tone and collaborative mentality would be set.

A problem we encountered with analyzing blockchain in the table grape supply chain is that the technology is still so new, that not all participants knew about it, and were therefore not as interested nor knowledgeable on the matter. This only allowed us to get an insight in the doings of the business and not the future. However we propose possible uses of blockchain for all participants and believe that their acceptance of it will be facilitated with the benefits provided.

We hope that we can inspire research of bigger magnitudes where all these limitations are taken into consideration and hopefully managed to have less of an impact.

10. References

- Abrahamsson, A. (2006) Sustainopreneurship – Business with a Cause. in Science for Sustainable Development – Starting Points and Critical Reflections, Uppsala: VHU – Föreningen Vetenskap för Hållbar Utveckling (Swedish Society for Sustainable Development), pp. 21-30. ISBN 91-631-9222-5
- Aitken, R. (2017). IBM & Walmart Launching Blockchain Food Safety Alliance In China With Fortune 500's JD.com. Forbes. [online] Available at: https://www.forbes.com/sites/rogeraitken/2017/12/14/ibm-walmart-launching-blockchain-food-safety-alliance-in-china-with-fortune-500s-jd-com/#42c03d37d9c5
- Aitken, R. (2017). IBM & Walmart Launching Blockchain Food Safety Alliance In China With Fortune 500's JD.com. *Forbes*. [online] Available at: https://www.forbes.com/sites/rogeraitken/2017/12/14/ibm-walmart-launching-blockchain-food-safety-alliance-in-china-with-fortune-500s-jd-com/#42c03d37d9c5
- Armerding, T. (2018). *The 17 biggest data breaches of the 21st century*. [online] CSO Online. Available at: https://www.csoonline.com/article/2130877/data-breach/the-biggest-data-breaches-of-the-21st-century.html
- B. Hesterman, O. and Horan, D. (2017). The demand for 'local' food is growing — here's why investors should pay attention. *Business Insider*. [online] Available at: http://www.businessinsider.com/the-demand-for-local-food-is-growing-2017-4?r=US&IR=T&IR=T

- Bauerl, N. (n.d.). *What is Blockchain Technology? - CoinDesk*. [online] CoinDesk. Available at: https://www.coindesk.com/information/what-is-blockchain-technology/
- Baumgartner, R. and Rauter, R. (2017). Strategic perspectives of corporate sustainability management to develop a sustainable organization. *Journal of Cleaner Production*, 140, pp.81-92.
- Being wise with waste. (2010). Luxembourg: Publication Office of the European Union.
- Bender, W. (1994). An end use analysis of global food requirements. Food Policy, 19(4), pp.381-395.
- Birkeland J. 2002. Design for sustainability: A sourcebook of integrated, ecological solutions. EarthScan: London.
- Brubaker, R. (2015). The Next Big Thing For Entrepreneurs: Sustainability. *Forbes*. [online] Available at: https://www.forbes.com/sites/ceibs/2015/09/09/the-next-big-thing-for-entrepreneurs-sustainability/#7cc9e4105aa9
- Burrell, G. and Morgan, G. (1979). Sociological paradigms and organisational analysis. London: Heinemann Educational.
- Carrefour Group. (2018). *Carrefour launches Europe's first food blockchain and plans to extend the technology to eight more product lines before the end of 2018*. [online] Available at: http://www.carrefour.com/current-news/carrefour-launches-europes-first-food-blockchain-and-plans-to-extend-the-technology-to
- Charlebois, S. (2017). How blockchain technology could transform the food industry. *The Conversation*.
- Crals, E., & Vereeck, L. (2005). The affordability of sustainable entrepreneurship certification for SMEs. International Journal of Sustainable Development & World Ecology
- Cuomo, J. (2018). *Understanding blockchain: Debunking the myths of enterprise blockchain - Blockchain Unleashed: IBM Blockchain Blog*. [online] Blockchain Unleashed: IBM Blockchain Blog. Available at: https://www.ibm.com/blogs/blockchain/2018/05/understanding-blockchain-debunking-the-myths-of-enterprise-blockchain/

- Datafloq.com. (2017). How Blockchain Can Help Combat Climate Change. [online] Available at: https://datafloq.com/read/how-blockchain-can-help-combat-climate-change/2531
- Dees, J. (2007). Taking social entrepreneurship seriously. *Society*, 44(3), pp.24-31.
- Deloitte (2013). *From exponential technologies to exponential innovation*. [online] Available at: https://www2.deloitte.com/insights/us/en/industry/technology/from-exponential-technologies-to-exponential-innovation.html
- Deloitte (2013). *The food value chain A challenge for the next century*. [online] Available at: https://www2.deloitte.com/ie/en/pages/consumer-business/articles/the-food-value-chain.html
- Deloitte (2017). *Blockchain risk management Risk functions need to play an active role in shaping blockchain strategy*. [online] Available at: https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/risk/deloitte-nl-risk-risks-posed-by-blockchain-models.pdf
- Deloitte (2017). *When two chains combine Supply chain meets blockchain*. [online] Available at: https://www2.deloitte.com/ie/en/pages/technology/articles/when-two-chains-combine-.html
- *Ec.europa.eu. (2010). Being wise on waste. [online] Available at: http://ec.europa.eu/environment/waste/pdf/WASTE%20BROCHURE.pdf*
- Edelman.com. (2017). 2017 Edelman TRUST BAROMETER - edelman.com. [online] Available at: https://www.edelman.com/trust2017/
- Edureka Blog. (n.d.). Blockchain Technology | What is Blockchain | Blockchain Tutorial | Edureka. [online] Available at: https://www.edureka.co/blog/blockchain-technology/
- Food Safety. (2018). *Approval of active substances - Food Safety - European Commission*. [online] Available at: https://ec.europa.eu/food/plant/pesticides/approval_active_substances_en
- Globalgap. (2018). *About us*. [online] Available at: https://www.globalgap.org/uk_en/who-we-are/about-us/history/
- Hart, S. and Milstein, M. (2003). Creating sustainable value. *Academy of Management Perspectives*, 17(2), pp.56-67.

- Hayzlett, J. (2018). 3 Major Industries in Which Blockchain Technology Is Changing Life As We Know It. *Entrepreneur*. [online] Available at: https://www.entrepreneur.com/article/308987
- https://www-tandfonline-com.esc-web.lib.cbs.dk:8443/doi/pdf/10.1080/01608061003756455?needAccess=true
- https://www.edelman.com/trust2017/
- Iansiti, M. and R. Lakhani, K. (2017). The Truth About Blockchain. *Harvard Business Review*.
- Interpol.int. (2018). *N2018-033 / 2018 / News / News and media / Internet / Home - INTERPOL*. [online] Available at: https://www.interpol.int/News-and-media/News/2018/N2018-033
- ITUM, I. (2018). Inicio - ITUM. [online] ITUM. Available at: http://www.itumgrapes.com/
- J. Perry, M. (2016). Mark as favorite Fortune 500 firms 1955 v. 2016: Only 12% remain, thanks to the creative destruction that fuels economic prosperity. *AEI*. [online] Available at: http://www.aei.org/publication/fortune-500-firms-1955-v-2016-only-12-remain-thanks-to-the-creative-destruction-that-fuels-economic-prosperity/
- Kaad-Hansen, L. (2017). *Denmark the world leading organic nation*. [online] Organicdenmark.com. Available at: http://organicdenmark.com/organics-in-denmark/facts-and-figures
- Kalb, I. (2013). Innovation Isn't Just About Brainstorming New Ideas. *Business Insider*. [online] Available at: http://www.businessinsider.com/innovate-or-die-a-mantra-for-every-business-2013-7?r=US&IR=T&IR=T
- Knowles, M. (2017). Blockchain: Dole and Driscoll's on board. *Eurofruit*. [online] Available at: http://www.fruitnet.com/eurofruit/article/173170/blockchain-dole-and-driscolls-on-board
- Label Insight (2016). *How Consumer Demand for Transparency is Shaping the Food Industry*. [online] Available at: https://www.labelinsight.com/request-webinar-access-food-revolution
- Linich, D. (2014). The path to supply chain transparency. [online] Deloitte Insights. Available at:

https://www2.deloitte.com/insights/us/en/topics/operations/supply-chain-transparency.html

- Maas, T. (2017). *The Quick, 3-Step Guide to Blockchain Technology. – Hacker Noon*. [online] Hacker Noon. Available at: https://hackernoon.com/3-steps-to-understanding-blockchain-8a285572daa3
- Mauri, R. (2018). *Three features of blockchain that help prevent fraud - Blockchain Unleashed: IBM Blockchain Blog*. [online] Blockchain Unleashed: IBM Blockchain Blog. Available at: https://www.ibm.com/blogs/blockchain/2017/09/three-features-of-blockchain-that-help-prevent-fraud/
- Medium. (2017). Managing Our Water Supply With Blockchain – Impact Chain Lab – Medium. [online] Available at: https://medium.com/@impactchainlab/managing-our-water-supply-with-blockchain-46aaf0b7f530
- nibusinessinfo.co.uk. (2018). *The CMR note: the key road transport document*. [online] Available at: https://www.nibusinessinfo.co.uk/content/cmr-note-key-road-transport-document
- Oliveira-Castro, J., Foxall, G. and Wells, V. (2010). Consumer Brand Choice: Money Allocation as a Function of Brand Reinforcing Attributes. *Journal of Organizational* Behavior Management, 30(2), pp.161-175.
- Parris, T. and Kates, R. (2003). *Characterizing and measuring sustainable development*. pp.559-586.
- Parrish, B. (2010). Sustainability-driven entrepreneurship: Principles of organization design. *Journal of Business Venturing*, 25(5), pp.510-523.
- Pikart, M. and Baxter, A. (2016). *Traceability for Sustainable Trade A Framework to design Traceability Systems for Cross Border Trade*. New York and Geneva: UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE.
- Provenance. (2015). *Blockchain: the solution for supply chain transparency | Provenance*. [online] Available at: https://www.provenance.org/whitepaper
- R. Eisenmann, T. (2013). Entrepreneurship: A Working Definition. [online] Available at: https://hbr.org/2013/01/what-is-entrepreneurship

- Richardson, J. (2008). The business model: an integrative framework for strategy execution. *Strategic Change*, 17(5-6), pp.133-144.
- Robinson, D. (2013). *Ikea drawn into horsemeat scandal*. [online] Ft.com. Available at: https://www.ft.com/content/3969cb1a-7f50-11e2-89ed-00144feabdc0
- Robinson, L. (2009). A summary of Diffusion of Innovations. *Creative Commons*. [online] Available at: http://www.enablingchange.com.au/Summary_Diffusion_Theory.pdf
- Rogers, E. (1983). *Diffusion of innovations*. 3rd ed. New York: Macmillan.
- Saunders, M. (2009). Research methods for business students. 5th ed. Harlow: Pearson Education.
- Saunders, M., Thornhill, A. and Lewis, P. (2016). Research methods for business students. 7th ed. Harlow: Pearson.
- Schumpeter, J. (2008). *Capitalism, socialism and democracy*. New York: Harper Perennial, p.80.
- Sheetz, M. (2017). Technology killing off corporate America: Average life span of companies under 20 years. *CNBC*. [online] Available at: https://www.cnbc.com/2017/08/24/technology-killing-off-corporations-average-lifespan-of-company-under-20-years.html
- Sisco, C. and Chorn, B. (2010). *Supply Chain Report 2010*. 2nd ed. United Nations Global Compact.
- The Economist (2011). Don't shoot the cucumber. [online] Available at: https://www.economist.com/node/18775111
- The Economist (2017). Why QR codes are on the rise. [online] Available at: https://www.economist.com/blogs/economist-explains/2017/11/economist-explains-0
- Tremlett, G. and Pidd, H. (2018). Germany admits Spanish cucumbers are not to blame for E coli outbreak. [online] the Guardian. Available at: https://www.theguardian.com/uk/2011/may/31/e-coli-deaths-16-germany-sweden
- Vladimirova Dr, D. (2014). New business models for a sustainable future. *Institute for manufacturing*, [online] 2, p.16. Available at:https://www.ifm.eng.cam.ac.uk/uploads/IfM_Review/IfM%20Review%202/IfM%20Review%20Issue%202.pdf

- Warc.com. (2018). *Alibaba deploys blockchain to tackle food fraud | WARC*. [online] Available at: https://www.warc.com/newsandopinion/news/alibaba_deploys_blockchain_to_tackle_food_fraud/40392
- Wilson T. (2007). The 'food miles' fallacy. The IPA Review, Vol. 52 (2), pp. 41□43.