Research Topic

Artificial Intelligence contribution to sustainability in the food industry of Barcelona

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Abstract

The food industry of Barcelona is primarily responsible for production and supply chains of food that maintain suppliers and customers worldwide. The network of parties associated with the food industry is facing difficulties and challenges, that affect not only the existing businesses and future markets, but also humanity. Disruptive changes in the food industry are crucial. Hence, this paper is primarily investigating the existing demand of sustainability from a macro-, such as a global; meso-, such as Europe and Spain; and a micro-, such as Catalonia and Barcelona, perspective to connect how artificial intelligence could be a solution to sustainable development. The main findings shows that one third of all produced food globally is currently going to food waste, at the same time as the global popularity is predicted to increase, and that the demand for produced food will increase. Correspondingly, organizations in the food industry have a responsibility to decrease the contribution to local food waste and work with sustainable management throughout the whole supply chain, with a shared goal to produce more- and purchase food, in a better way. The specific need of the local industry contains a gained understanding for consumption predictions, knowledge about the effect of sustainable actions as well as transparency in the food supply chain. Artificial intelligence possesses the possibility to automate and optimize several processes that can facilitate organizational work that the food industry is in need of. To conclude, the purpose of this paper is to contribute to a movement of the topic further, with a vision to achieve a sustainable world for future generations.

”’Change is no longer a matter of choice.”
–Wayne Visser
The Age of Responsibility: CSR 2.0 and the New DNA of Business

Chapter 1: Introduction

This thesis is original research that investigates what strategies the food industry of Barcelona can optimize and automate existing processes with the technology artificial intelligence, with the aim of becoming more sustainable and responding to the external global issues in the supply chains of food. More specifically with the central research question; *How can artificial intelligence solutions help managers in the food industry improve their business models and supply chain to make it more sustainable?*

The food industry

The associated parties of the food industry are facing challenges that sooner or later could force businesses to pay attention to their performances from a sustainable perspective (Turkeş M. et al., 2020). Already, stakeholders and external trends are pushing for changes regarding the organization's responsibility towards society and the climate (Buchanan, D. & Badham, R., 2020). For instance, the food industry is globally facing uncertainties (Sell, S. K., & Williams, O. D., 2020) regarding current aspects such as the predicted access of natural resources, climate change and the ongoing development of technology, which makes it necessary for companies to prepare and work towards sustainable options (FAO, 2018). In addition to this, the industry further contains several issues from a macro, the global, perspective (Dieterle, J. M., 2020), such as environmental impact, food waste and food insecurity. To overcome the current and predicted challenges in the food industry, sustainable work is crucial. Sustainability can be defined from a holistic perspective by the United Nations that describes their work with sustainable development, a development that contributes to current global human needs without compromising or limiting future generations to do the same (The United Nations, 2015).

From a meso perspective, more specifically the food industry of the European Union, including Spain, has to change its current food systems (European Environment Agency, 2019) to contribute to achieve the goal of the European Union (2020): *"In 2050, we live well, within the planet's ecological limits"*.

The sustainable demand continues even from a micro perspective, in Catalonia and Barcelona, where a development of a progress towards a method of more sustainable production solutions are strategically recommended for the entire Catalonia (Government of Catalonia, 2018), the province that Barcelona is located in. With this sustainable demand in mind, Barcelona is the largest metropolitan of the province Catalonia in Spain, with 27 million inhabitants in the mega-region and an important role in the industrial sector, where food production is one of the key areas. Barcelona supplements customers all over the world and has also a high contribution to the European market. It is one of the main food producers of food, and contains a network of food markets that represent the largest in Europe (Ajuntament de Barcelona, 2018).

The Artificial Intelligence and its current application

Nowadays, we live in a modern high-tech society, where artificial intelligence is a part of our everyday life (Cai, Y. & Abascal, J., 2006). The overall opportunity with artificial intelligence is that it can work with collecting knowledge and information, and by analysis of the data, solve specific complex problems (Boullart, L. et al., 2013) or generate business value (Cheatham, B. et al., 2019). The handling of knowledge works in a way which it can obtain new results and conclusions without being explicitly programmed for it. For instance, obtain useful insights that can result in predictions to support in strategic decision making (Boullart, L. et al., 2013). Moreover, many people associate artificial intelligence with smartphones (Makridakis, S., 2017) and the customized advertisement by algorithms on social media platforms or websites (Johnsen, M., 2017), that are based on previous searches or navigation online. Also, it is often associated with solutions that help people or society, for example in healthcare (Goralski, M. A. & Tan, T. K., 2020). Likewise, artificial intelligence is often perceived as the intelligence behind physical robots (Larson, D. A., 2010), which can be one area of use, but overall, it automates and optimizes processes (Samanta, S., & Chakraborty, S., 2011), such as facilitating organizational work (Jarrahi, M. H., 2018), influencing innovation (Cockburn, I. M. et al., 2018) and knowledge management (Liebowitz, J., 2001). As well as energy saving (Jones, M. A. et al., 2013) to improve the manufacturing processes (Bullers, W. I. et al., 1980). Artificial Intelligence can be defined in several ways, but most commonly, it is described as a wide range of computer science (Cawsey, A., 1997), with objectives to create systems that can function intelligently and independently. To clarify, artificial intelligence is a system characterized by digital computers or physical computers controlled by robots in terms of digital technology, that are able to execute tasks with intelligence performance (Homami, R. M. et al., 2014), such as reflect regarding; reason, meaning, generalize and learn from historical experiences (Britannica, 2020). The future of artificial intelligence is still in progress and superintelligent computers can be developed with both risks and benefits (Makradis, S., 2017), the focus in this thesis is therefore how artificial intelligence can contribute today from its current potential and open up for a discussion on what solutions that are or could be developed from that.

Thesis goals

The thesis goals are dual. Firstly, an exhaustive literature review of the food industry, secondly, followed by proposing possible solutions for a sustainable industry in the catalan market, specifically the food industry of Barcelona. The paper is organized in four sections. The first section will provide a better understanding of the current situation of the food industry in Barcelona, its limitations and the sustainable challenges, as well as the latest applications of artificial intelligence in this industry. The paper follows an abductive methodology, and thus the second section will be addressed by using a qualitative methodology by four interviews to study in depth the issues that can be tackled by artificial intelligence. The third section will reveal the findings, and the fourth section will conclude and raise awareness of the need for further research concerning artificial intelligence solutions in the food industry.

Chapter 2: Literature Review

Key concept

To understand how artificial intelligence can contribute to sustainability in the food industry of Barcelona, we need to understand the adopted potential of artificial intelligence, although the topic of this thesis does not require advanced technical knowledge, only understanding of the idea of usage and basic technology will be reviewed. Consequently, we need to gain insights of aspects such as the current issues, predicted challenges and the need of a sustainable transition from a holistic perspective in the food industry. More specifically, factors that are affecting the associated parties of the sector today. This paper will also focus on these associated parties in the sector from a local perspective, regarding the food industry in Barcelona, since we also need to understand the local industries impact on the rest of the world, to prove it's relevance of contributing to sustainability on a global level. Accordingly, we also need to understand what main challenges the local market are facing, what the local supply chain contains, and what the current demand is from a micro perspective, to be able to identify and prove the relevance of artificial intelligence solutions.

Potential of artificial intelligence

Artificial intelligence is especially useful for complex decisions, which are too complicated for regular standard programming or would implicate an immense manual effort with high expenses (Boullart, L. et al., 2013). For instance, artificial intelligence can be implemented to execute data and workforce analytic, which are expressed as significant aspects to work with for companies, to become competitive and in a superior business position. An eight diverse paper presents that the result of working more effectively with workforce analytics, can result in an increased ability for managers and leaders in companies to achieve their strategic and operational goals more effectively. The benefits of working with data and analytics could be an important aspect of how to optimize management in the food industry, potentially through artificial intelligence, since the technology of artificial intelligence has the ability to use the existing data to make even more efficient predictions (Huselid, M. A., 2018).

The most perceptible organization performance improvements are achieved when humans and artificial intelligence machines work together (Wilson, H. J., & Daugherty, P. R., 2018), according to findings from a research of 1500 companies. In addition to this, the capability of artificial intelligence is furthermore than automating existing processes. The leaders of tomorrow, with objectives to enhance organizations, should, therefore, embrace artificial intelligence in their overall strategies (Jarrahi, M. H., 2018). In addition to this, the fullest potential of artificial intelligence is reached when leaders are taking advantage of it in all their strategies that correspond to everything from operations, markets, industries, and their workforces (Wilson, H. J., & Daugherty, P. R., 2018). Overall, knowledge about how artificial intelligence can contribute to sustainability is still in progress (Quinn, J. et al., 2014), regardless of what industry, but

it has definitely a potential to change the existing systems in the food industry. For instance, disrupting practices in the current supply chains (Singh, G. et al., 2014).

Controversies of artificial intelligence

This paper's hypothesis includes a focus on whether artificial intelligence can contribute to sustainability in the food industry from a current state of development, rather than a strategy for implementation or future technology. Therefore, the importance regarding controversies of artificial intelligence is not as relevant, as if the purpose contained a tactical plan or a research regarding the future of artificial intelligence. On the other hand, it could be advantageous to gain an overall recognition for the current risks, for further understanding and investigation. For instance, regarding the credibility of artificial intelligence data could be manipulated by human decision making and behaviours (WEI KE., 2019), the existing challenges in the usage of intelligent computing used for knowledge management (Alvarado, M. et al., 2007), or from a broader perspective, the responsible usage should be retained while also minimizing consequences from the power that comes with artificial intelligence (Cheatham, B. et al., 2019).

The food industry's supply chains

The global supply chain of food literally contains segments such as; agricultural production and harvesting; post harvesting such as packaging; storage; transportation; processing; wholesale and retail, also enabled as distribution; consumption by households; and consumption by food services, also enabled hospitality professionals (FAO, 2019). The food supply chain requires a network of infrastructure (Ross, A. et al 2012) and information (Bosona, T., & Gebresenbet, G., 2013), a broad system in need of maintenance and development to promote economic and environmental improvements and profitability, therefore also including a vast of opportunities of streamline and optimization (Singh, G. et al., 2014). In supply management decision making from a sustainable perspective, managers need to consider and analyze information to manage a potential risk situation, including actions to reduce the risks from the food supply chain, the potential socio-economic effects and environmental impact (AESAN, 2020).

Current issues in the food industry

Food waste

One of the main issues in the food industry is that of all food that is being produced annually, one third goes to food waste. The annual amount of food waste is currently 1.3 billion tonnes globally, which corresponds to a value of $1 trillion (The United Nations, 2020). Food waste could be described as the decreased outcome of quantity and quality of food, based on food services, retailers, consumer's actions or decisions (FAO, 2020). Food waste could also be directly connected to every market in the food industry, since the waste occurs during the whole supply chain, all the way from initial agricultural production to household consumption (Parfitt, J. et al., 2010). The main reasons for the

waste is the transportation, harvesting practices of food, and that food ends up in bins or retailers by consumers (Halloran, A. et al., 2014). The fact that food waste corresponds to a third of all food that is being produced and appears as an issue on every level in the supply chain, in particular primarily during transport, harvesting and by consumers, indicates that there is a potential of saving food by working with solutions to prevent food waste (FAO, 2019).

The food waste continues in every perspective of markets that the food industry of Barcelona can be associated with. In the European Union, the estimated food waste is measured to approximately 88 million tonnes per year, which infer a value of 143 billion euros. This equals that the food waste in the European Union accounts for 20% of all food produced (Stenmarck, Å. et al., 2016). Likewise, the food waste occurs even in Spain and Catalonia, although there is a gap of current data. The latest estimations of Catalonia at 2010, showed that 262,000 tonnes of food was wasted annually (Barcelona Metropolis, 2017). On the other hand, it is possible to find measurements from 2018 of food waste from households in Spain, for example that 4,3 percent of all purchased bread from consumers are going to food waste (MAPA, 2019), although these numbers are not proving the waste that occurs from the whole supply chain, which is relevant for this paper.

Food insecurity

At the same time as the waste of food is a main issue, conversely 2 billion people are estimated to suffer from hunger in the world (The United Nations, 2020). The issue of hunger is in the food industry termed by expressions and called food insecurity, which also is categorized as two sublevels, severe and moderate. Severe means undernourishment to the extent of starvation, which constitutes 9.2 percent of the world population, 700 million people, and moderate is described as the lack of regular access to nutritious and sufficient food, which 17.2 percent, 1.3 billion people, in the world are suffering from (FAO, 2017).

Food insecurity is primarily related to food and, therefore, a problem the food industry could take responsibility for (Barrett, C. B., 2010). Predictions are showing that if patterns from "business-as-usual" investments continue to grow, the access of food will not be improved at all by 2030 (FAO, 2017). Although, the geographical spread differs and food insecurity is higher among lower-middle-class countries. According to statistics from FAO (2019), food insecurity as a problem is most expanded in continents such as Africa and Asia, and occurs least in Northern America and Europe**.** The geographical difference between the continents is important to pay attention to, since even though the food industries supply chain's have an opportunity to influence the issue of food insecurity on a global level, it could be more prioritized where solutions could contribute with a direct effect (Weinberger, K., & Lumpkin, T. A. 2007).

Contribution to environmental damages

At last, the existing issues in the food industry also includes the global food consumption and its appurtenant production, use, and waste management, that are primarily

responsible for environmental effects. The food category is together with housing and transport responsible for 70 percent of the environmental impacts. Meat and dairy within food are the priority. Consequently, the food industry's contribution to environmental effects proves the need to stop the negative development and create sustainable food solutions for future generations (Tukker, A., & Jansen, B., 2006). Agriculture, logistics and food processing are the phases that have the highest impact on the environment concerning the food supply chain, according to the categories of food in the average food consumption in Europe (Notarnicola, B. et al., 2017).

Challenges

The holistical challenge for businesses in the food industry is to produce *more food in a better way*, based on several aspects (Weinberger, K., & Lumpkin, T. A. 2007). One of the aspects is the forseened increased demand for food, illustrated by the predicted global population growth from 7.8 billion in March 2020 to 9.7 billion people in 2050 (The United Nations, 2019), which clarifies that we need to produce more food to feed more people (Reardon, T. et al., 2015). In addition to this, the labor that are involved with food production and agriculture, will be affected by the predicted increase of urbanization, that accounts for 68 percent of the world population will live in urban areas by 2050 (The United Nations, 2018). A change that mainly can have a negative effect on rural located food suppliers, on the contrary, positively their distributors and hospitality professionals in urban environments. At last, the production processes of the food industry need to adapt to climate change (Antle, J., 2010), which corresponds to both optimizing existing and developing more sustainable and efficient methods to produce food (Fraser, E. D., 2006).

The need for sustainable transition

To overcome the current issues, predicted challenges (The United Nations, 2015) and to meet the consumer's demand of sustainability (Bartels, J., & Onwezen, M. C., 2013) in the food industry, sustainable work is crucial (The United Nations, 2015). The demand regarding sustainability is also supported by The future of food and agriculture that arguments for the hypothesis in this paper by paying attention to how "*sustainable food and agriculture systems cannot be achieved without significant additional efforts"*. Further, the author describes how it is crucial to change the current business models on a management level (Yip, G. S., 2004), to businesses that maintain actions on how to renew used assets in order to produce more products or services, improve the existing processes or to contribute to new innovative solutions (FAO, 2018*)*.The United Nations has developed seventeen global sustainable development goals, enabled as the SDG goals, that pay attention to more specific areas of what aspects sustainability refers to. The goals are designed to achieve a sustainable future and include areas that affect the global challenges the world is facing. Every business, regardless of what industry, can contribute to the objectives (The United Nations, 2019).

The work with corporate social responsibility is primarily the strategies that can contribute to a change in the world (Feix, A., & Philippe, D., 2020). A review of businesses historical work with corporate social responsibility(further entitled CSR in

this thesis), including "Ages of Greed, Philanthropy, Marketing, and Management, using defensive, charitable, promotional and strategic CSR approaches respectively" has been made to develop a modern responsible CSR 2.0, that meet the current social-, economic- and environmental demands. Further, the developed proposal of how to work with CSR, is by building a core business around sustainability and includes the sustainable perspective of every holistic strategic management decision (Lin, Y. C. et al., 2019). Every decision should be made after considering potential consequences and contributions to society and the environment. This modern CSR work shows how companies in the food industry can implement CSR work more comprehensively in their strategic management and core business to challenge external demands (Visser, W., 2010).

Another reason for working with sustainable strategic management and corporate social responsibility from a business perspective is that it can also result in increased profitability and innovation for businesses (Ajour El Zein, S. et al., 2019). Sustainability is related to competitiveness in a positive way, (Lee, K. et al., 2003), since the sustainable approach of business has transmitted to bring competitive advantages more than the classic approach (Buono, A. F., & Kerber, K., 2010). The key to the work is by implementing a pervading framework that develops, implements, and controls strategies and contributes to sustainability both for internal and external stakeholders. The structure should be generated from a holistic business perspective, to be able to identify opportunities and threats in every aspect of the company and identify how to integrate those together (Bini, L. et al., 2020). Suggestions of categorizations in a framework as that on a management level can be normative management, strategic management, and operational management (Andersen, P. H., 2019). As a matter of fact, sustainable strategic management and suggested frameworks can be used in the food industry to develop sustainable businesses, increase their profit, and be more competitive (Baumgartner, R. J., 2014).

The local food industry of Barcelona

Primarily, the food industry of Barcelona, Catalonia and Spain, is facing the same challenges as the rest of the world (Marín-Murillo, F. et al., 2020), as mentioned earlier in this paper, the increased demand of food production, urbanization and climate change. Although, it's important to understand its correlation and differences to the global industry, with the aim of securing how the further proposed solutions ahead in the thesis could be considered as sustainable in every aspect and from every perspective of markets, but locally and globally.

Global impact

The food industry in Spain can be considered as having a significant impact on the global food sector since the Spanish market of food and groceries is one of the largest in comparison to other European countries, with a 6.7% share of 2018. The Spanish food industry also involves comprehensive supply chains that reach worldwide, and the market is predicted to grow even more. The market value for the Spanish food and

grocery retail market had a value of $138,692.8 million in 2018 and is predicted to increase 13.5% from 2018 to 2023, which maintains a market value of $157,370.9 million. The food and grocery market includes retail sales of all food products such as unpackaged, packaged beverages, tobacco, and household products. The largest segment of the food and grocery market is food, which accounts for 72.5% of the total market value, which corresponds to $114,093.9 million. Challenges in the European market to consider on a strategic management level is that the consumer's negotiation power is high and environmental challenges are predicted threats (MarketLine Industry Profile: Food & Grocery Retail in Spain, 2020).

According to the Generalitat de Catalunya (2020), the local food industry corresponds to a 16.28% of the GDP of Catalonia which equals a turnover of €35,205M, and is the leading sector in the economy of Catalonia. In addition to this, the food industry in Catalonia are mutually affected by the global market, according to facts from 2016, that "*agrifood products exported from Catalonia had a value of EUR 9.627 billion and imported products worth EUR 9.696 billion"* (Generalitat de Catalunya, 2018).

What is the sustainable demand from a micro perspective?

The businesses in the food industry in Barcelona are affected by the global demand, but also a political demand from the local government, as well as the consumers' adaptation towards trends, gained knowledge and environmental values. More specifically, businesses in the food industry of Catalonia have to follow a law about the prevention of food losses and waste by the government, with the purpose of contributing to the global sustainable development goal 12.3, to reduce 50% of all food waste by 2030 (United Nations, 2016). The law requires organizations to have a tactic plan regarding how to measure and prevent food waste with a duty to annually report the actions and outcomes (Generalitat de Catalunya, 2020). In order to achieve this intention of the law of food losses, Catalonia developed a Zero waste strategy that involves the social economy, as public companies and groups, in the prevention and promotion of the work (Ajuntament de Barcelona, 2016). The strategy are based on the zero waste philosophy, which has been defined in various ways by different entities, but can be described as "*The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health."* (EPA, 2018). The zero waste strategy of Catalonia includes aspects of zero waste but also includes the idea of implementing circular economies. In addition to this, the city council of Barcelona has made a commitment on a local level, by developing an action plan with specific objectives to reach by the end of 2020, that align with the Zero waste strategy.

Sustainable consumer behaviours

The consumer's perspective can be considered as an obstacle to aim sustainable development for businesses in the food industry of Barcelona, since the consumers have a vital role to change, and most sustainable solutions will not be successful without consumer acceptance. For instance, the work of disrupting existing businesses to a more sustainable approach is generally driven by innovation. To illustrate this, innovative

solutions can contain food products or services that are environmentally friendly, which additionally means that they need to be supported politically and often include vast investments, but primarily, a sustainable success of the solutions requires consumers willingness to pay for them (Antonides, G., 2017). On the contrary, the consumer's demand regarding local produced food is increasing (De-Magistris, T., & Gracia, A., 2016), which indicates a certain sustainable awareness (Grebitus, C. et al., 2013). Moreover, consumers need to be motivated to buy sustainable food, for instance, engaged in sustainable consumption, be committed, and be aware of consequences from waste (Brons, A., & Oosterveer, P., 2017). To demonstrate the correlation between consumer perception and the current issues in the food industry, we refer to a survey that was given to 418 consumers of the metropolitan area of Barcelona regarding food waste. The result was according to the author that "*food waste is directly influenced by purchasing discipline, waste prevention habits, materialism values and indirectly influenced by environmental values"* (Diaz-Ruiz, R. et al., 2018).

Summary literature

The existing research mostly consists of theoretical studies. There is a vast number of authors focusing on the food industry from a global perspective, referring to the issues where they are all argumenting for a current need for a sustainable transition and the reasons behind it. The difference in the research is how some studies digs deeper into specific issues and challenges in the industry, meanwhile others describe the current situation more as an overview.

The empirical studies are mostly focusing on measuring existing issues and how to implement sustainable management frameworks. For example, the existing literature provides research, models and data that describes how the companies in the food industry could to maintain sustainability and work towards internal changes. On the other hand, there is a gap regarding advantages of external solutions that could help the associated parties, to work towards sustainability, by implementing them in current business models and frameworks. Above all, there is a gap of both empirical and theoretical studies about how the technology of artificial intelligence could contribute to sustainability in the food industry, both on a global and local perspective, to solve the current needs and predicted challenges. Artificial intelligence is further explored by authors in other industries, which is used in this thesis to prove its potential and to be able to explore solutions that can be customized for the food industry. There is also a gap of reliable sources that provides research on a micro perspective, about how the sustainable demand in the food industry in Barcelona today and what obstacles that stops the associated parties to develop more sustainable businesses.

Chapter 3: Methodology

This thesis addresses the current problems and sustainable work in the food industry from both a macro-, global; meso-, Europe and Spain; and micro-, Catalonia and Barcelona, perspective to comparing its similarities and differences to be able to identify suggested solutions by adapting to artificial intelligence. The outcomes of this thesis will more specifically help to fill in those gaps in the literature that are described in the literature review summary of this paper, and inform practitioners about the need for further essential steps and a change thereof. This area has not being explored with objectives directed towards the food industry of Barcelona, so in order to ensure the reliability of this thesis, we will use the current research consisting of both empirical and theoretical studies from secondary sources, that has been raised from a global scale regarding the food industry, sustainable management and artificial intelligence, and further analyze those in comparison to the Barcelona industry, by collecting insights on a micro perspective from primary sources. This data will be compared in order to find connections and possibilities to development towards a more sustainable industry. Moreover we will provide suggestions based on conclusions from a deep analysis, supported by realistic arguments from the current status of businesses in Barcelona.

Abductive methodology

The methodology for this paper is reviewed and explored from an abductive research methodology, which is a systematic approach by working from a combination of different parts of the research and data collection process, including both theoretical and empirical research, to develop new theories. The abductive approach was chosen to be able to identify general ideas and principles without assumptions of where the starting point of the paper should be, before conducting understanding for the current status of the topic. The method is furthermore to investigate from different perspectives, with a pursued segmentation of the food industry and artificial intelligence with a selection done by analyzing the potential strategic purpose, qualitative data and theoretical generalization. To clarify, the selections are segmented with the aim of achieving an holistic understanding as well as developing concepts and theories. Existing research and theories are compared with consideration regarding adoption of how well they could support the papers hypothesis.

Research methodology

After conducting an exhaustive research of the current status of the food industry of Barcelona, as well as exploring the literature of the potential solutions adopting artificial intelligence, we were able to identify the current situation, and the gap of missing research regarding the topic. The methodology adopted in this paper is qualitative, therefore, to be able to collect the information about the sustainable demand in Barcelona, our developed strategy was to contact professional business people with current experience from the industry; in addition to that, to collect information about

potential solutions, where we understood that we had to narrow the potential of artificial intelligence to its current status of development. Due to the nature of the topic, and the ambiguous future of artificial intelligence that is still in progress, where superintelligent computers can be developed with both risks and benefits ahead, the further focus in this paper is therefore how artificial intelligence could contribute with solutions to the food industry today, from its current potential. In addition to that, we seek to raise awareness of its importance and initiate a discussion on what solutions that could be developed from this investigation. Hence, the methodology adopted is an abductive approach to bring up new ideas for both sectors, the food industry and artificial intelligence.

Data collection

Qualitative methods were chosen in this thesis to gather several perspectives from a variety of professionals that execute in the sector today and intend to accomplish the proposal of the study. Since the existing research lacks information about the sustainable demand in Barcelona, this will further be collected in interviews from professionals of the local market.

Research proposal

The proposition of this research is to clarify the current and future situation of the food industry, to be able to identify opportunities such as a new hidden possibility, where artificial intelligence can be used to improve with generated ideas about solutions, towards a more sustainable food industry. Furthermore, the outcomes proposed by collecting information about the application possibilities of artificial intelligence into the food industry, will enable practitioners to identify potential solutions for the companies that are willing to adapt to a new sustainable sector, as well as contribute to the current literature by raising awareness of the need of the sector´s paradigm shift.

Chapter 4: Findings

The current possibile practices of artificial intelligence

The existing literature showed that possibilities of usage regarding artificial intelligence in the food industry, could be aimed for development regarding several aspects. Therefore, this paper will raise awareness of how artificial intelligence could be a solution to the Barcelona food industry's practitioners to become more sustainable, without any guarantee of improvement, but including qualitative research with an ability of moving the topic closer towards development and implementation of solutions. The technology of artificial intelligence consists of possibilities that could maintain a vast technical knowledge to develop, and therefore we're paying attention to its potential solutions and not execution. To clarify, the awareness that this paper maintains is just a starting point, but it will open up for more research thereof. Moreover, the aspects that artificial intelligence could contribute to in the industry, according to the findings in the

literature review, refers to areas from both management and operational perspectives. By further presenting the current practices of; sustainable work, obstacles and demand in Barcelona, we will be able to connect this potential of artificial intelligence as a solution to the local industry.

The current practices of sustainable work in Barcelona

The findings conducted by interviews showed the current practices of the food supply chain in the food industry of Barcelona. There are some similarities and differences in the findings when investigating the food industry from a micro perspective, the perspective that occurs as a gap in the review of existing literature. To exemplify those findings, we are paying attention to the identification of how current practices towards minimizing food waste and the current development towards sustainable improvements, are mainly executed by a purpose of meeting the food industry's consumers' demand. Furthermore, the conducted findings from interviews on the local market are compared and analyzed towards the research regarding the global perspective and towards potential practices of artificial intelligence. In addition to this, the interviews showed what the associated parties consider as their main challenges in sustainable development and what obstacles they are confronting when working to achieve their sustainable objectives.

We have collected the information by interviews from different parties in the food supply chain, to be able to get an understanding from several perspectives and identify potential similarities or differences. The interviews are collected from following parties of the food supply chain and are found in the appendices:

- *Producer* (Appendix1):
  Clarice Vargas, CEO of Salvados Beer, which is a Circle economy producer company, that is producing beer from bread waste. Located in Barcelona.
- *Hospitality professional* (Appendix 2):
  Cristina Peres, Quality and environment coordinator at The Majestic Hotel Group, which is a Catalan hotel group with five star unique luxe hotel and properties, eight hotels and three residences of apartments. Primarily located in Barcelona.
- *Distributor, third-party solution* (Appendix 3):
  Lea Blanchard, Co-founder of GastroCampo, which is a digital market company that provides consumers and hospitality professionals in Barcelona with sustainable food from local food producers.
- *Distributor, food service* (Appendix 4):
  Yessica González, Co-founder of Colibri, which is a sustainable store in Barcelona that provides consumers with food within the category of bulk and other products with long duration.

The overall result included some similarities in the parties way of executing and resonating around sustainable work. For instance, the willingness of the parties to raise awareness regarding sustainability and position themselves as more sustainable towards consumers, suppliers and other stakeholders, that all parties expressed during the interviews, which align with the global demand regarding sustainable performance

(Turkeş M. et al., 2020). In addition to that, all distributors and the hospitality professional expresses an obstacle regarding the access- and securing sustainability of suppliers. We will further demonstrate the parties sustainable practices by summarizing the current work, to prove its existence and relevance, and to be able to discuss patterns or surprises in the data.

Actions towards food waste

All of the presented parties from the food supply chain are performing by actions that could be directly connected to either prevent or create a new value from food waste. Correspondingly, the issue of food waste occurs even in the local food industry, likewise what the existing research gave an indication about, although that the existing research controversy only included outdated measurements, and only current data from a global perspective.

One of similarities that we have identified is the way of working towards decreased food waste, collected from the primary sources. More specifically, how the third party distributor, GastroCampo, and how the distributor Colibri, has developed their whole business model in a way that functions as a solution to prevent food waste, in consideration of their geographical local focus and type of products. To illustrate this, GastroCampo is providing local hospitality professionals sustainable food, on a digital platform. The type of food they are providing are evaluated from a sustainable perspective by investigations on several aspects, such as sustainable labels and research. Further, the business model is established by only containing partners in the local food industry of Barcelona, which therefore indirectly are shorting the possible transportation that the food supply chain can include. As a result of only purchasing from local suppliers, the transportation could be generalized as shorter than usual, rather than importing from geographical locations from a further distance (Schnell, S. M., 2013). Likewise how another business model in the food industry, vertical urban farming, contributes to resource savings in terms of minimized food losses, as a result from less transportation (Kozai, T. et al., 2019). Consequently, GastroCampo decreases the risk of food waste that usually occurs during the food supply chain, which contributes to sustainability since transportation is a main reason why food waste occurs at all (Halloran, A. et al., 2014). In addition to Gastro Campos business model, the distributor Colibri also exemplifies a focus on local suppliers to prevent food waste, by containing a product portfolio of dry food with long duration, prioritizing sustainable packaging (Verghese, K. et al., 2015), and by adapting their purchases of food to differences in seasons and insights regarding consumer behaviour.

The prevention of food waste that those distributors, GastroCampo and Colibri practices, by focusing on local suppliers, could be proved as relevant when comparing to secondary sources of artificial intelligence solutions, for example the benefits and demand of producing food from autonomous aeroponic systems (Pala, M. et al., 2014). Likewise how the conclusion can be done that producing food from autonomous aeroponic systems could be one of the answers to the challenge to *produce more food in a better way* (Weinberger, K., & Lumpkin, T. A. 2007), the existing practice and possibilities of both GastroCampo and Colibri as distributors can be the answer of *how*

to purchase the food. After that comparison, a conclusion can maintain an additional part to the challenge, that the food industry also needs to *purchase the food in a better way*, by choosing local, as well as finding the right suppliers, as a further step to bring value to the existing sustainable producers and to contribute to the challenge of more and better food in the world. This also aligns with the requirements of consumers willingness to pay as a vital role to change, to achieve sustainable success in the existing sustainable production solutions (Antonides, G., 2017).

Henceforth, the producer Salvados beer, has established their business model in line with a circular economy model (George, D. A. et al., 2015), by producing beer from bread waste, like the case of this company in the UK (Connolly, R., 2019). Instead of preventing food waste like GastroCampo, Salvados Beer creates new value propositions from waste that already occurs from other food producers, by collecting bread waste and transforming it into beer, which also contain a longer duration than bread, which equals in a possible longer time of storage before the product could go to waste again. According to their data of food waste, one and a half pieces of baguette are thrown away every two second in Spain, which is founded on calculations from the Spanish Ministry of Agriculture, Fisheries and Food (MAPA, 2019). In addition to that, bread waste is placed as a third of all categories of food where high levels of food waste occurs, where fruits and vegetables are even worse, which proves the validity of waste even for other products.

Likewise Salvados Beer, the hospitality professional, the Majestic hotel group, creates new value from food waste, where the waste is continuously donated to charity organizations. The collected data and insights from the Majestic hotel group, showed that approximately 3850 kg, which corresponds to 21% (KPIs in Appendix 2) of their purchased food goes to food waste. To demonstrate the volume, the Majestic approximate volume of purchased food is 18410 kg in total every month. In addition to that, the food has an essential part of their business, since expressly 70 percent of all their purchased products every month are food. Measurement of food waste occurs on a daily basis through a third party company, a private company that takes responsibility and actions of the waste such as pick up as a service, recycling and data collection. Those measurements are shown in detail in Appendix 2, to open up for discussions of the relevance of working with food waste solutions even on a deeper management level. For this reason, the Majestic hotel has a strategic sustainable goal to decrease organic food waste and to create value from it by increasing donations of food. The current average percent of donations from the food that otherwise would have gone to waste, is 2,3 % (KPIs in Appendix 2). Due to Covid-19, it could be important to mention that those measures occured in January and February 2020, before the pandemic. The pandemic could further affect the Majestics amount of food waste because of changed consumer behaviours and purchases of food. Therefore, it could be necessary to include the impact of Covid-19 to predict future amount of food waste more exactly, although, the percentage of food waste in correlation to amount of purchased food could retain its relevance.

At last, Colibri pays attention to how the practices to minimize food waste for them as a distributor can be improved by adapting their range of products due to seasons and consumer demands on a higher level. A practice that requires an intelligence regarding consumer behaviours and a culinary knowledge about food, data and information that could be collected by measurements that they don't have today.

Sustainability in the supply chain

A common challenge for the distributors is to access local producers that align with sustainable requirements, since most of the local producers are not digitized and therefore require resources in terms of time, to identify and investigate. Both GastroCampo, Colibri, Salvados Beer and The Majestic hotel groups are paying attention to the access of sustainable suppliers as an obstacle, that are limiting them from developing the sustainable level of their actions. In addition to this, a surprising insight was the essential focus on sustainable evaluations, with a purpose of enabling and collateralizing potential suppliers and partners from a sustainable perspective. For example, a necessary process in Gastro Campos regular execution, due to their brand positioning as a sustainable provider of food from local suppliers, also since the dispersion in consisting sustainable labels (Sirieix, L. et al., 2013). The evaluations are based on criterias and aspects that could define the sustainable level of potential sustainable suppliers or partners, similar to this study (Loo, E. J. et al., 2014). To illustrate, the criterias that GastroCampo primarily are investigating are expressly based on; relevant research regarding sustainability and sustainable farming; the catalunya law and strategic objectives, as the zero waste initiative; collection of information from physical investigations; perception of the social structure of the company; and at last sustainable labels, that although differ in relevance (Gracia, A., & De-Magistris, T., 2016), therefore the labels need to be investigated from different aspects. To clarify, a producer could have an organic label, but at the same time execute labor conditions against normal norms. Similar to GastoCampo, the hospitality professional, Majestic hotel group, and the distributor, Colibri, are also focusing on sustainable suppliers by either relying on the information they receive from potential partners, or by internal research and individual evaluations. The Majestic hotel group also pay attention to implication in regards to the sustainability of existing processes, products or services, with current suppliers; how it is a challenge even regarding that, to determine the level of sustainability and that the work infer resource allocation to achieve progress. The current investigation process by all parties, including physical and theoretical evaluations regarding sustainability, although the profound of it differ, could be considered to maintain a high vast of resources internally, in terms of time used by the workforce (Solow, R. M., 2014).

Although the practitioners focus on local suppliers, the current logistic solutions are limiting the parties to fully adapt to the sustainable supply chain as they want, according to both Salvados Beer and Gastro Campo. To illustrate, GastoCampo refers to a generalization of restaurants, about how their purchased food from producers usually contain small volumes, in comparison to the producers effort regarding transportation of the order, especially when the orders don't appear at the same time. To clarify, separate

transportations for individual customers with customized orders contributes to a higher vast of unnecessary transportations, waste of resources and costs.
Moreover, another factor that limits sustainable development are the internal and external sustainable knowledge. Accordingly, Gastro Campos perception is that most of their potential customers, such as hospitality professionals; more specifically chefs or managers in restaurants and hotels, want to work towards becoming more sustainable, but at the same time GastroCampo experiences a common lack of knowledge in these segments. In addition to this, even though the hospitality professionals maintain a sustainable willingness; it could collide with their own consumers' demand, since the demand and willingness do not always share the same vision. The Majestic hotel group proves this perception from GastroCampo, by showing their current challenges in sustainable development, which they refer to internal communication and about the purpose of sustainable work. They're focusing on bringing more knowledge today by measuring sustainable knowledge through an yearly evaluation.

To summarize, the current practices and insights from the interviews of food waste proves the validity of the issue, and how it occurs in the local supply chain as well as the global. Further, the importance of sustainability in the supply chain as both a contribution to minimize the food waste, but also to work toward sustainable development. The main obstacles that prevent businesses from being more sustainable today, regardless of what party, are both the access and knowledge about sustainable options by suppliers and the differences in the social perceptions about how to define a company, product or a service as sustainable. In addition to this, there's no common framework or scale that justify the sustainable level, which is why every associated party in the food industry has to make their own decision about how sustainable a product/service, partner or supplier are, based on existing resources as internal knowledge. The decision could be based on options that maintain an inefficiency process due to the utilization of resources. The lack of sustainable definitions also aligns with the challenge to identify sustainability in existing or potential suppliers' supply chain. For instance, the interviews show a pattern of uncertainties regarding research for potential suppliers, in terms of suppliers that align with both the consumers and environmental demands. This could indicate that transparency is missing in existing supply chains, and solutions for that could be needed, as well as internal understanding for internal executions and external understanding for stakeholders impact on sustainable development in supply chains. However, the businesses could take responsibility for their own development, and therefore measurements that maintain understanding of actions and stakeholders impact from a sustainable perspective could be useful to evolve the knowledge about sustainability.

The sustainable demand of the food industry in Barcelona

The overall sustainable demand could, to begin with, be summarized by the research from the literature review as findings, first on a global scale, which also indirectly affects the local industry in Barcelona. The primary global findings that affect the Barcelona industry are the need to fight food waste, need for sustainable management and need of solutions with a lower environmental impact. Secondly, the demand from a

micro perspective is partly found in the existing literature as well, where the need of the Catalan market consists of adaptation to laws and regulations regarding waste, as well as gain understanding for consumer behaviours. Therefore, the need for data collection could be crucial to predict consumption, and by adapting the purchases and usage of food, to minimize food waste.

In addition to those aspects that occur in existing literature, the collected qualitative research from primary sources in interviews, are showing further demands and challenges in the local food industry. For instance, the willingness to promote sustainable actions towards stakeholders and gaining sustainable knowledge, both internally and externally. Hence, to measure the sustainable effect from actions could be needed to provide understanding of whether practices are sustainable or not, as well as the extent of sustainability.

Furthemore, the collected qualitative research in the Barcelona food industry, shows a need for efficient access and collateral of sustainable requirements regarding potential suppliers, as well as the processes of sustainable development with existing suppliers, are in need of optimization. Therefore, transparency in the food supply chains is needed. Transparency as a solution, also aligns with the differences regarding sustainable perception and the need to improve current evaluations of sustainable labels, since today practices maintain a manual collection of information with a high vast of resources, in terms of time, to investigate potential companies sustainable level.

Artificial Intelligence, a solution to the food industry in Barcelona.

To connect the findings of artificial intelligence and the findings from current practices in the Barcelona food industry, we will raise awareness to how artificial intelligence could more specifically be used for complex decisions such as; sustainable management development and supply chain management; analytics and execution of data regarding consumer behaviours and food waste; as well as workforce management to optimize the usage of resources more efficiently.

As a result of this identified connection between the two investigated topics, we are able to dig deeper in further suggestions, to contribute to a movement of the topics of this paper even further. Correspondingly, we have narrowed down possible areas of usage of artificial intelligence in the barcelona food industry, that we suggest a further development of solutions. These suggestions will help us raise awareness about potential development, and help the food industry to better understand the proposal of artificial intelligence possible contribution within customized potentiality areas due to the local food industry of Barcelona, and by that maintain an inflection point to start the change. In addition to the customization of the following suggestion, we have also considered the main aspects from the research about how to successfully work with sustainable development internally. Both from a sustainable management, CSR and supply risk management perspective, aspects that should be executed by taking potential consequences in terms of socio-, economic- and environmental impacts into account.

Measuring the sustainable effect of executions

Sustainable development that is based on sustainable indicators are proved being able to measure (Azapagic, A., & Perdan, S., 2000). According to the current practices of food waste and the interviewed practitioners willingness to promote the sustainable work towards consumers, suggestively measurements of the sustainable effect from actions could be generated, tentatively due to areas of usage and depending on the purpose and sustainable objectives, suggestively by artificial intelligence to aim patterns and smart predictions to identify possibilities to improve.

A customized proposal based on the primary sources regarding the Barcelona food industry, could contain calculated estimations in terms of; *the sustainable effect by choosing local suppliers,* based on executed actions that prevent the risk of food waste and carbon footprints. To demonstrate, the measurements could more specifically be established by calculations that show estimations about how much savings of food waste and carbon footprints that is done by choosing local suppliers and providers in comparison to how much food losses, consumed fuel and co2 emissions that otherwise appears from transportation (Tukker, A., & Jansen, B., 2006). Similar to how Salvados Beer calculates each saved bread, that otherwise would have gone to waste, per each produced beer (Appendix 1). For instance, by calculating the individual party in the food industry usage of food miles (Passel, S. V., 2010), in comparison to the average transportation of food in the food industry. From that incidence, calculate individual parties savings of food waste and carbon footprints. To exemplify, calculations could be established by the average food waste that usually occurs during transportation in correlation to individual calculations of food waste developed from the individual food miles, since transportation is a main reason for food waste (Halloran, A. et al., 2014). Furthermore, the measures could be directed towards food waste per a certain amount of distance, for example waste per km. Likewise, carbon footprints from individual food miles could be calculated in comparison to an average or a climate budget, similar to how the Swedish food producer company, Orkla foods Sverige, affiliate of the Norweigan Orkla Group, are providing their consumers a climate impact tool to estimate the environmental impact that their food products maintain, based by biogasses and co2 emissions, in correlation to a daily budget of acceptable carbon footprints (Orkla, 2019). To summarize, data and analysis by artificial intelligence could prove the sustainable effect including decreased food waste, carbon footprints and possible other aspects, by choosing local suppliers. In addition to this, the relevance of choosing local suppliers are not only proved from a sustainable perspective, but also due to the current pandemic Covid-19, which can affect consumers behaviour and extend the choice of local food suppliers (Hobbs, J. E., 2020). By that said, measurements of the sustainable effect from certain actions, could equal a potential of competitive advantages (Buono, A. F., & Kerber, K., 2010) for both the producers and distributors, to market themselves, supported by statistics, when promoting themselves towards stakeholders.

Data collection of consumer behaviours and consumption predictions

As well as the measurements of sustainable actions could contribute to awareness regarding impact of different practices, which could equal in possibilities to promote the sustainable actions towards stakeholders; equally important could be to understand consumers behaviours to predict patterns of consumption, to be able to adapt purchases of food in correlation to sales. Since the consumers behaviour plays an important role in the food industry's possibility to contribute to sustainability (Antonides, G., 2017), a crucial aspect for the food industry is therefore to understand their consumers on a deep level. To clarify, by data of consumer behaviour, the purchased volumes of food could be more customized towards sales and less food would go to waste, as well as the range of food could be customized after the consumer demands. By artificial intelligence, data can be collected by measurements, research and information on aspects that could help the food industry to improve its sustainable work. To exemplify, proposed suggestions could maintain measurements of consumer behaviours and analysis of consumptions predictions, which could be both resource efficient and smart integrated from a holistic perspective with the food industry's supply chains (Bini, L. et al., 2020), when developed by artificial solutions, rather than manual programming or calculations. This could be developed both by the food industry itself or by external industries. Proposed information to collect and identify from artificial intelligence, that also align with data protection regulations such as GDPR (European Union, 2016), could be; amount and location of located distributors, hospitality professionals or people that live in the targeted area; average amount of consumers/guests/businesses that purchases per a certain amount of time; value and volume of purchases, possible consumer information such as segment and sustainable values. To conclude, this suggested data collection could provide the food industry possibilities to adapt the purchases of food, as well as the production of food and therefore optimizing resource allocation and maintain economical savings, but also strategic decisions, in a way that will have a clear positive sustainable impact.

Transparency in the supply chain

To be able to contribute to purchasing food in a better way, the consumers of food, distributors and hospitality professionals, need to be able to identify the sustainable productions. Transparency is crucial to make this happen. Data collection and analytics regarding transparency in the food supply chain executed by artificial intelligence (Singh, G. et al., 2014), could be a solution for the parties to be able to make sustainable decisions regarding what partners or suppliers to work with. The current labels that exist in the European market could be an aspect to observe (Gracia, A., & De-Magistris, T., 2016), together with a deeper analysis to collateral the sustainable level with consideration of socio- economic and environmental aspects from multiple perspectives, such as certifications, code of conduct, reviews etc. This proposal is further to use artificial intelligence to improve the transparency regarding supply chains in terms of mapping companies value chains and sustainable level on every step. This could be developed similar to the service that the company SGS(2020) in Madrid provides, that proves the possibility of digitizing food supply chain management. SGS provides their customers with an opportunity to analyze their own supply chains from producer to

consumer, on a digital platform. On the contrary, this comprehensive analysis is focusing on providing the customers this service with a purpose of improving its own, and not mainly a sustainable perspective. Therefore, we want to raise awareness for digitized automated food supply chain management solutions that could be developed by artificial intelligence with the purpose to track sustainable aspects of several local suppliers' supply chains, with a purpose to mainly provide the food distributors and hospitality professionals with information to give them the opportunity to purchase more sustainable food. A solution that aligns with the local sustainable demand in Barcelona's food industry and could be necessary to change the current practices of purchasing food, towards sustainability in terms of achieving the global SDG goals from the United Nations (2019). Solutions like this would maintain possibilities for the distributors and hospitality professionals to secure the sustainable level of purchases and by that an ability to promote their sustainable supply chain towards their consumers, as well as the suppliers will be given the possibility to analyse their own supply chains, identify opportunities to improve and promote themselves towards the distributors and hospitality professionals. Further development could maintain ratings and reviews on the suppliers from stakeholders, according to investigations of the practices of the sustainable work. Additionally, solutions like this could be developed even to rate the sustainability of distributors, by collecting information through artificial intelligence, which for example could be integrated by how much food a party actually needs to purchase in relation to its sales and data predictions about their consumers future purchases and behaviours. By collecting this data with artificial intelligence, the collection could be done even more intelligently and on a broader scale, than manual programming (Boullart, L. et al., 2013).

Chapter 5: Summary, Conclusions, Limitations and Recommendations

Summary

It is possible to identify from the interviews from current practices, that the global issues, such as food waste and environmental impact, are pushing companies to take responsibility toward action. On the other hand, the challenges on a micro perspective indicate that there are some existing obstacles that are limiting the local industry to work towards the global demand to that extent that they should to be adequate, both according to more profitable business solutions, the external stakeholders or the global socio-economic- and environmental challenges, that humanity are facing. As this thesis already has paid attention to, artificial intelligence is a technology with a broad range of potential solutions, which could contribute to fill the current demand regarding sustainable development in the local food industry of Barcelona.

Conclusions

The aim of this thesis was to contribute to the food industry to become more sustainable and respond to the external global issues in the supply chain of food. It also consisted of

dual sub objectives in terms of first reviewing the current situation and future regarding sustainability in the food industry, to gain a holistic understanding, and to be able to propose possible solutions for contribution by artificial intelligence. Equally, the purpose was to raise awareness, and at the same time developing concepts and theories to facilitate further development of potential solutions.

Based on the investigated research from existing literature about the potential integration of artificial intelligence, together with the collected information about the food industry, both on a macro, global; meso, Europe and Spain; and micro, Barcelona and the interviewed parties perspective, we have been able to discover that *artificial intelligence can contribute to sustainability*, suggestively by the proposed possible *solutions that could convert the food industry of Barcelona and possible develop a more sustainable existing business models and supply chains.*

Limitations Section

The interpretation of research and data has been done subjectively, and it will therefore have a risk of containing biases that might have influenced the results. For instance, the interviews could be subjective in the way of what companies are chosen, and how the interviews are formed in terms of how we have developed the questions according to the topic. It is impossible to collect information and write a thesis from an objective perspective, since biases and experiences affect why the topic is investigated in the first place, but by collecting research from several aspects and perspectives, we provide a relevant objective perspective to understand and investigate the hypothesis of this paper. On the contrary, the demand for sustainability in Barcelona could be different than how we have been described in this paper, since the qualitative conducted interviews are collected from four parties, that represent a market existing of approximatley 3600 companies (Ajuntament de Barcelona, 2012).

Another important limitation is regarding how we were not able to find any interviewer with an expertise regarding the technology of artificial intelligence, which could have given this paper verification to the proposal.

Due to Covid-19, the estimated calculations of food waste are based on before the pandemic, hence, those numbers could be changed forwards. On the other hand, the pandemic Covid-19 could affect consumers behaviour and extend the choice of local food suppliers (Hobbs, J. E., 2020), which therefore could affect the current consumption patterns as sales in correlation to volume of purchases.

Recommendations and further contributions

Since this topic has not been explored before, primary recommendations are to further investigate how those solutions could be implemented in the most optimum way. Further investigation before adapting to artificial intelligence should therefore suggestively include a deeper analysis regarding its benefits and risks, to gain awareness about how to implement artificial intelligence with responsibility and efficiency. For instance, will the proposed solutions be developed from external business models, since the development

of artificial intelligence solutions could require a higher knowledge of technology? On the other hand, how would the external parties collect the crucial knowledge and understandings in the food industry, both on a macro, meso and micro perspective? Or will the implementation of suggested solutions be done as improvements of existing business models of the food industry with customized objectives, assuming that the usage of artificial intelligence will be easier and the knowledge about it will increase? Or will the most efficient implementations be done when collaborations occur between the food- and external technical industries, as a strategic management partnership?

Another recommendation is further analysis regarding optimization of current logistic systems in Barcelona's food industry, as an addition to the proposed solution about how artificial intelligence could contribute to transparency in the supply chain. The analysis could investigate how artificial intelligence could possibly optimize the current logistic systems that GastroCampo refers to (Appendix 3), integrated with traceability that the transparency could maintain (Bosona, T., & Gebresenbet, G., 2013), with the aim to achieve a larger sustainable effect in terms of minimizing unnecessary transportation even more.

Further recommendations could also be to investigate potential implementation of the research and findings in this paper to other markets than the Barcelona food industry, since this thesis has given both differences and similarities between the global and the local perspective, that could possibly be valid and usable even for other local food industries around the world.

Also to recommend, after the industry has adapted to those proposed solutions with artificial intelligence and a deeper development is allowed, further investigation could be executed by artificial intelligence technology, that confirm the value of sustainable work in terms of sustainable return of investments. The return could be integrated with other artificial intelligence solutions in the food industry, and show the return as a saving on resources in aspects such as all the socio- economic and environmental, as well as savings in the same way as current practices, that contains sustainable risk predictions, which is needed in sustainable management (AESAN, 2020). To clarify and to relate to the proposed suggestions in this paper, the return of investments could be calculated on saved resources by investing in knowledge about sustainability, as well as investing in collecting information of consumer behaviours to predict in consumption patterns and by investing in transparency in the supply chain.

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Appendices

Appendix 1

Interview with Salvados Beer, Barcelona

With the Co-founder Clarice Vargas

Full interview

GDPR notice. This conversation is being recorded and the data collected can be shared both internally and externally with and without personal identifiers, you may establish any limitation to the use of the data, request statements to be off record, anonymised or to withdraw entirely from participation at any time. Do you consent to the data policy and to being recorded?

Yes

Would you mind telling me about yourself first, who you are, your work and role?

I'm from Brazil and came to Barcelona 4,5 years ago. The reason was that she wanted a change in her professional life. Used to work for a large Telecom company in Brazil, where I was accountable for all the sales and strategies in the B2B segment of Brazil. I had a lot of responsibilities and wanted to take a pause in my career, and rethink my direction. I decided to join an exectuive MBA where I met two friends with common passion about sustainability. Then we started to write our thesis about a shop that would sell only food products that were close to expiration date. Then we started to work with other food waste projects here in Barcelona, for example the project "food sharing" from Sweden, a volunteer group that collects food that is going to be wasted and donate to people in need. Also a corporate private initiative, weshare, and a project that collected food for donations here in Barcelona. That collection of food waste and donating it was forbidden before, but now the laws are changing. The work we did with food waste back then was only with the purpose to donate, but then we realized we were a bit limited in our possibility to impact the food waste by that work. To clarify, the ability we had with the food waste we collected was only to provide our closest neighbourhood with donations and that was it. We wanted to have a greater impact, outside Barcelona and outside our zone.

When we started to look at statistics about food waste, we identified that bread waste was the third most wasted food in Spain. Only fruits and vegetables are worse. It is almost 1,5 baguette of bread that goes to waste every 2 second.

We therefore started to work with another initiative to try to reduce the bread waste, the company To Good To Go[1], which is an app. To Good to Go is redistributing the waste by connecting consumers, restaurants and providers, and selling food that is close to expiration date. The consumers of the app are able to search for the closest located distributor that has food close to expiration by a map, which they can buy for a lower price. There are a lot of initiatives like this one, but there was no company that recycled the food waste and reinvented it into new products to sell with a new value proposition.

Then we decided to try to reuse the waste and produce something delicious from it, like beer, as well as a product like that has a longer duration, which indirectly will minimize the waste. There is a similar company in the UK, that also produces beer from bread waste. Therefore we contacted for a potential partnership but they declined the proposal since they're not active in Spain, so therefore we decided to start our own company. To summarize, All of the mentioned things were more or less the background to the development of Salvados Beers business model. We wanted to reach out on a larger scale than our neighbourhood and by that have a bigger impact on the issue of food waste.

When did you start?

We started to work on the project around november 2018, and then during the first 6 months of 2019, we prepared 5 different recipes of beer and we did crowdfunding for investment. We had 109% percent of the financiation through the crowdfunding campaign. During the crowdfunding we also started to market the product by some beer tasting and events. We collected feedback as well, with the purpose to secure the quality of the product.

Have you implemented any artificial intelligence solutions in your company today? Yes or no? If yes, what solutions and why?

No, not yet.

When you are producing the beer, what suppliers are you using and how are you

[1] To Good To Go company https://toogoodtogo.es/es

choosing them from a sustainable perspective?

We have recently changed our supplier of bread to a strategic partner that aligns with our concerns regarding sustainability, which is selling ecological bread, but also other options as vegan. They are also distributing bread to all of Spain. Another strategic partner is the brewery of producing the food. The brewery has not reviewed all his processes from a sustainable perspective yet, such as electricity. Although, the brewery has reduced the water waste by changing the system of producing the beer to a circular system and recycling the water instead of a linear production.

We are using glass bottles but we're also evaluating to use canners, but it's hard to know what material that is most sustainable. It is very difficult to say because the production of both materials includes different types of energy and glasses, as well as the transportation of them includes differences like that as well.

We only want to produce Salvados Beer in Spain, even as a future vision, since we don't wanna contribute to more carbon footprints.

How do you collect knowledge regarding all those sustainable aspects?

Investigating, a lot of researching, talking to people in the business, talking to people that are connected to sustainable communities.

Who do you sell to? Who is your targeted group?

We started in stores that are vegan, with the same concerns regarding sustainability. Another segment is restaurants, but due to Corona, we haven't started expanding to that segment yet. We only want to partner with parties that have the same concerns regarding sustainability. We also work close to an organization named Restaurantes Sostenibles[2], they promote us and we also get connections from them.

Regarding consumers, our targeted groups are people that love craft beer, as well as people who are very aware about sustainability, for example that are involved in communities or organizations of veganism, zero waste, fighting against food waste, etc. Sometimes those segments are the same, but that's not very common. The craft beers lovers are more focused on the taste of the beer, while the sustainable people care a lot about your processes, vision and goals - who you are and why you do what you do.

[2] Restaurantes Sostenibles, https://www.restaurantessostenibles.com/quienes-somos

How do you communicate that sustainable process to the targeted group?

We promote our processes of production, our partners, our values. We also partner a lot with initiatives that share the same values as us, to market ourselves in the right direction.

When you sell to distributors that sell the beer for you, how can you make sure that they communicate that and give the consumers the knowledge?

It's a lot about trust, one partner is a store that we knew from before and I personally buy food from them because I trust their processes, as well as I trust that they promote us, and are doing business in a good way. Another example is that we found a new potential partner that we didn't have an existing relationship to, therefore we investigated the store by a physical meeting, their website, social media etc., to make sure they aligned with our values and were following their promises. This is something we have to do everytime we start a new conversation with a potential distributor, then we propose a business relation with them based on our findings. Overall, it is not hard for us to find distributors here in Barcelona, since a lot of distributors share our visions. A reason is also that we get a lot of contacts from the sustainable communities we are involved in, as well as we personally are consumers of many stores and restaurants ourselves, therefore we usually already have a perception about how they are executing business. There are many communities of groups in Barcelona regarding sustainability, that are discussing new ways of living, consuming and similar topics. We are a part of those groups in different ways, for example social media platforms and whatsapp. For example, Vidas Sostenibles, that are trying to help people gain knowledge of a more sustainable way of living.

How do you want to position yourself? Why?

As sustainable, we created Salvados Beer because we wanted to fight food waste, since that's our biggest concern. We are working with bread waste now but we would also like to expand the actions towards food waste by focusing on fruits and vegetables as well, for example to flavour the beer. Primarily since local producers are not able to sell everything they produce, so therefore we can partner with them to produce from their waste. We want to avoid food being wasted. This is also a way to communicate to people that it's time to change the mindset regarding food consumption.

What are your sustainable objectives?

To fight food waste and raise awareness in terms of helping food consumers to look at food from a different perspective. We don't have a more specific goal then that at the moment because we have to determine our commercial strategy and a SMART goal. We had a pause in the business during winter because of private reasons, and now when we're back the Corona started, but this is a thing we will focus on.

How do you measure how your work contributes to achieving that objective?

We know for sure how much bread we need for the recipe and by knowing how much bread that currently goes to food waste in Spain, we can measure how much food we save by producing the beer. We know that every bottle of beer, 33cl, saves 1.5 loads of bread.

What challenges have you been facing so far regarding sustainability?

Explaining to people about the quality of the bread that is going into the beer recipe, that it actually contains a good quality, as well as explaining the possibility of recycling in this way. Another challenge could be with strategic partners, which is to find them, suppliers with the same mindset about sustainability but that also has a sustainable credibility. This is very important for us because our stakeholders such as partners and consumers, can be very critical, so the challenge is also to convince people that we actually have a good sustainable product.

What kind of processes you are working with today could help achieve your sustainable goals, by being automated?

Logistics and transportations in terms of collecting food waste in a smarter and easier way from different providers to your production center. To clarify, logistics that could integrate several pickup locations, inform what route is the most efficient and sustainable, also synchronize the pickup date and time and organize the logistics from that. Primarily to make it easy for the providers to donate the food but also to make the cost less for the producer, so the food waste collection is worth the effort even from an economic perspective. To clarify, a company that produces cold pressed juice from food waste, could have 10 different supermarkets that donates fruits to them.

Another thing could be due to coronavirus, is that how the statistics of bread could be automated and could be more updated. We can for example see during the economic

crisis 2008, that the bread increased, and it would be useful to make a comparison from that to now. What we know though, is that more people are baking at home right now, so then the sales of bread should have changed as well. In addition to that, another data we have been able to collect is regarding the changed behaviour of beer drinking during corona. We know that industrial beer has increased, like Estrella Damm, Moritz and similar brands have increased with 80% during this time.

Similarly, automated processes could be used for optimization of bakeries. For example how they could be open instead of closed, by trying to optimize their processes by producing less bread in correlation to the changed demand. They should do that until people are allowed to go on the street as normal again, because by then the selling will probably increase. Automated processes, and more specifically, artificial intelligence could maybe help the bakeries in this case with prediction, for example, how much they should increase or decrease the production in correlation to the demand and when. Additionally, mapping out how many people in a neighbourhood that are interested in buying bread and when, for example, some might buy only during the weekend and some everyday.

To conclude, the area of sustainability is so broad, there’s so many things you can do about it. Improving logistics, creating new products and improving the processes of producing etc. The most important thing is the area you're focusing on and what the main problem is there.

Appendix 2

Interview with the Majestic Hotel group in Barcelona

With the coordinator for the quality and environment department, Cristina Pares

Key numbers food waste

Waste january 2020:
Total: 18.422,14 kg
1,67 overnight?

Garbage: 6.881,3 kg
Organic trash: 4.240,26 kg
Paper: 2.211,55 kg
Glass: 3.091,57 kg
Plastic: 1.278,44 kg
Wood: 370 kg
Oil: 200 kg

Donations january 2020
Food: 71,4 kg
Blankets: 54 pieces
Mattresses: 13 pieces
Coffee capsules: 8,6 kg

Donations february 2020
Food: 110,70 kg
Taps (bottles): 14,60 kg

Waste february 2020
Total: 14.807,45 kg
1,48 kg/ overnight

Garbage: 4769,20 kg
Organic trash: 3469,22 kg
Paper: 1542, 39 kg
Glass: 2862,51 kg
Plastic: 1326, 14 kg
Wood: 505 kg
Oil: 200 kg
Nespresso: 6,80 kg

Average organic trash January and February 2020:
Organic trash: 4.240,26 kg January
Organic trash: 3469,22 kg February
Average organic trash: 3855 kg

Average donations January and February 2020
Food: 71,4 kg January
Food: 110,70 kg February
Average donations: 91,05 kg

Key numbers approximate volume of purchased food per month

MEDIAS APROX POR MES				
	MED/PED.	MED/KG	TOTAL KG.	MEDIA MES.
PED. PAN Y DERIV.	90	10	900	
PED. CARNES	70	50	3500	
PED. PESCADOS	90	25	2250	
PED. CONGELASOS	9	60	540	
PED. FRUTAS/ VERD.	90	120	10800	
PED. OTROS ALIM.	14	30	420	
TOTALES	**363**	**295**	**18410**	107085

KPIs

We have calculated those KPIs by using the numbers above, provided by the Majestic Hotels group:

- *Average food waste from total purchased volume of food* = 21%

(Average organic trash: 3855 kg / Average purchased volume of food 18410 = 20,9 %)

- *Average donations from food waste* = 2,3%

(Average donations: 91,05 kg / Average organic trash: 3855 kg = 2,3 %)

Full interview

GDPR notice. This conversation is being recorded and the data collected can be shared both internally and externally with and without personal identifiers, you may establish any limitation to the use of the data, request statements to be off record, anonymised or to withdraw entirely from participation at any time. Do you consent to the data policy and to being recorded?

Yes

Would you mind telling me about yourself first, who you are, your work and role, experience?

I have been working at the Hotel Majestics for 13 years, where I've been working as coordinator for the Majestics quality and environment department for the last 2 years.

My main responsibility is to ensure the quality from an environmental perspective and that all the employees are working from the rules and guidelines at the majestic.

The Majestic group has 7 Barcelona, and 11 in total in Spain.

Have you implemented any artificial intelligence solutions in your company today? Yes or no? If yes, what solutions and why?
No, the hotel doesn't implement any artificial intelligence.

How is the Majestic connected to the food industry?

We're both buying food, 60% of our purchased products are food, and we're consumers of the food since we're creating it for dishes and products that we're selling in our restaurants and in our breakfast. We are a part of the food supply chain.

<u>The Majestic are working from 3 external certifications:</u>
ISO 9001:2015 (quality) 14001:2015 (environment)
EMSA Regulation
Similar certifications - but ISO is international standards, and EMSA is only for europe.

When you work for these certifications, what kind of value does that give you as a hotel?

It's not very common to have those certifications in the hotel industry of Barcelona, many hotels in Barcelona have their own rules or guidelines instead. The certifications requirements work for any company in the world, regardless of industry. The value we receive from having this certification is that we're able to show the world that we are practicing sustainable actions and we are working to retain our quality, both from a

brand perspective in our market position, our customers and for our suppliers. The certifications also increase our ability to collateralize the standard of our suppliers, since we can compare our work to see if we work in the same direction. The standard of suppliers is otherwise a challenge for us to investigate, which is a part of my responsibility, to keep the hotel majestic to work in this line of sustainability but also the suppliers we work with as well.

When you're choosing suppliers and they don't have certifications. How can you make sure that they are as sustainable as you require?

We have to take actions step by step and try to choose suppliers that are delivering sustainable food. We speak to our suppliers and try to keep in their minds that we need to work in the same line. There's also a lot of internal employees in The Majestic Group, and we all need to be in the same line and the same circle regarding sustainability. Normally the work in the kitchen is one step behind the decisions so we need to make sure that everyone aligns when implementing changes, step by step. The process can also work from the way where we put an existing product on our to do list, and then start a sustainable development together with an existing supplier.

How many suppliers do you have regarding food?

The Majestic has approximately 600 suppliers today and 60 % are related to food and beverages. We receive food from the farmers every day or every two days, since we're a high quality hotel and need to have fresh food with the highest quality possible regarding the food we serve our guests.

How do you prioritize local farmers and do you have requirements regarding local food?

We are trying to buy more from local farmers but since we're a five star hotel we need to have food that satisfies a demand of guests that could come from anywhere in the world. To exemplify, guests from Italy, China and the United states. We want to serve food with the same quality that the guests could have in their own countries, to make them feel like they're home. Although, we are working towards buying local food more and more.

For example, I recently had an another meeting with another girl about a new product (example of a project):

The company works from food waste collected from farmers and is making marmalade from that. This company is the last that goes to the farmers to pick up food right before it goes to waste, then they work with people in poverty by giving them a job to collect the food and for the producing process. I told the chef that we should use this since it brings value for us as a hotel, so we have now started to buy this marmalade for our breakfast, which will contribute to giving more people in poverty jobs and supporting a sustainable

product.

When you are using a supplier that you can consider as a sustainable supplier, how do you communicate that?

We are not doing that at all today, but this is what we need to do.

Why is that important for you to start with this communication? Do you see a demand from the customers/have you perceived that the customers actually are asking for sustainable products or why is that important for you?

More people are asking and are more aware, but we need to communicate our sustainable work, and not to wait for our customers. We need to be proactive and ahead, since we want to position ourselves as sustainable.

Do you have any objectives and goals that you're working towards this position that you would like to have? Regarding food and sustainability?

Yes, one of my goals is to bring food waste as donations to NGO companies, to help people in poverty. This work has not been so easy, I had to fight a lot for that. The food waste hotel means that you need to bring the food to somewhere or someone - but it requires a lot of internal communication to change the process, and after changes, I also have to ensure that everything works well. We now have a contract for four years about donation but maybe one of my goals this year will be to negotiate that further.

Regarding the goal and food waste, when you developed that goal, do you have any specific amount of food waste, for example that you wanna decrease your food waste in a certain percentage? What kind of goal do you have more specifically?

Every month we receive a document with all the key numbers that we're donating, which we also can compare that with all the organic trash that we're generating every month as well. We also measure our trash and food waste by receiving numbers from a third party private company that comes everyday to take our waste. Organic, plastic, glass etc.

Do you have any goal regarding organic trash as well?

Yes, one of my main goals is to decrease the amount of organic trash and to increase the amount of donations.

How do you work to achieve that?

We're generating a lot of food, which is a shame. I have to collaborate with the chef to shorten the numbers. To be able to do this, we need to raise awareness and educate all employees so they have more knowledge about the process of food waste and sustainability.

What stops you from reaching your goals today regarding food waste and to decrease the organic trash and increase the donations?

We need to inform our staff more and train them so they have more knowledge about how to work in the kitchen to prevent food waste, as well as having knowledge about how to recycle. We need to train our organization to be more conscious about how the food waste can be used for donations instead of throwing.

We need to stop and start over. That's why we decided to start measures and take our food in balance, to know the exact weight to be able to improve our work. Even though we have numbers from a third party private company that picks up our waste, we're doing these measurements internally as well. The private company provides us with all the data/records at the end of every month. We believe this company and that they're doing well, but by measuring ourselves as well we can gain more knowledge about the process. Therefore, one of my goals is to take the weight of everything internally as well as to make sure and be more conscious about the waste we're having and accumulating. We will then compare the numbers with the third party, but primarily we're doing this to make sure that we're working in the right direction.

When you did that internally as well, did that bring you any new insights regarding food waste?

Yes, it did, and we are communicating the progress that internally to all the employees regarding this. This is so important, to give the right training to our staff.

Was it easier to communicate about food waste to your employees when you measured internally than when using the third party?

Yes, even though it's still not easy. We have employees of different ages and many are not in the same line regarding sustainability, they don't have the knowledge about it. We need to help them and communicate about "this is sustainable". I also believe that if people work like that professionally, the chance is higher that we will use this habit at home as well, which makes the effect even better. We need to take action step by step, and the first step for us is more training. The goal is not enough, we have to train and explain the purpose and importance of this work. This is a challenge.

If I understand you right, you say that the training, the knowledge and the engagement from the employees in general is the main thing that stops you right now from being/ or

reaching the sustainable goals of food waste?

Yes

Do you have any other goals regarding food, more than food waste? Regarding packaging, environmental impact or something else?

Yes we're also working with projects to reduce the plastic trash and paper. We have a plastic container that we can use for fruit for example and we're changing all the fruit, because it's more natural. We need to contribute to a circular work or circular economy.

So you are also working regarding recycling other materials as well?

Yes

When you are working with those kinds of projects, how many resources do Majestic usually allocate to this? In people, time, costs?

We have a group called a green team, including employers from each department of the company, that works to be innovative and develop sustainable ideas together, collaborate and transfer information throughout the company. The green team meets once every month and all included have their own responsibility and an action plan within their competence.

How do you ensure/ or measure how the employees are learning/the learning process regarding sustainability?

We have an yearly evaluation, an interview, which is executed by the head of every department. This is a measurement about how involved the employees are and how the knowledge is about the area they are working within.

Do you have the tools you need to do that? Do you have the knowledge? Are you satisfied?

I think that we every day change, and we need continually training and we can collect more knowledge from the government or external consultancy firms for example. We need to learn more about how we best can measure our knowledge.

Regarding the suppliers, what are your biggest challenges regarding finding sustainable suppliers?

Good question, but it is one of our biggest challenges. We have worked for many years

with most of our suppliers, but the industry changes and we have to make sure that our suppliers are changing in the same way. When we're researching new suppliers, it's hard to be aware about the whole supply change and we also have to make sure that we're changing our existing products to more sustainable options, which could also be with our existing suppliers. Although, we can't change every product immediately since the process takes a lot of time, so we're focusing on changing the primary products first that we use most and are less sustainable.

If I understand you right, when you're working with your existing suppliers, the challenge is to develop more sustainable products together with them?

Yes, and to do a meeting with another supplier and tell them that we need to change or convert the products and why.

But if you're looking for new suppliers, what is the biggest challenge in that situation?

To research about the supply chain behind the products and to make sure that it is sustainable.

Since you prioritize quality, and if you're choosing between several products - how do you prioritize between these following aspects sustainability, financial or quality?

Our manager and the strategy has changed so these days and the strategy is to prioritize following:

1. Financial/quality
2. Sustainability
3. Exclusiveness

Our head manager of purchases is for example sending me more options on sustainable suppliers.

Is there anything you would like to add that we haven't talked about how you work with sustainability as an hotel, your challenges or your part of the food industry?

No but I can send you an email about all the key numbers.

Appendix 3

Interview with GastroCampo, Barcelona

With the Co-founder Lea Blanchard

Full interview

GDPR notice. This conversation is being recorded and the data collected can be shared both internally and externally with and without personal identifiers, you may establish any limitation to the use of the data, request statements to be off record, anonymised or to withdraw entirely from participation at any time. Do you consent to the data policy and to being recorded?

Yes

Would you mind telling me about yourself first, who you are, your work and role?

I am the co-founder for GastroCampo together with another co-founder named Sofia. My background is that I was in an incubator named Founders institute, which is an incubator for entrepreneurs. The incubator connects you with other people and is supposed to help entrepreneurs, so the purpose for me was to develop a project. I had a project in the idea stage at that time. By doing things, I met my partner/co-founder. We both wanted to work with projects related to food and developed startups on our own during one year. After helping each other during the year, we decided to go together, since we were facing the same problems and challenges in the food industry. We both also have previous experience from working as account managers on larger corporations. The project I first developed during 8 months, was a catering firm that worked with sustainable awareness and actions with the objective to improve local consumption and minimize food waste. Sofia, the other co-founder, worked with a ghost-kitchen, which is a kitchen without a dining area and delivers only to restaurants.

I was also trying to develop a network and I had problems reaching the targeted group, and realized how hard it is for people to order sustainable and local food. The idea we later developed together was therefore to build a platform for the producers of food, both to contribute to local consumption and local production.

We're the co-founders, so our roles include everything from trying to build the platform, find producers, mostly related to food, we want to be able to transition to sustainable food consumption. From the business perspective, we want to eliminate the food waste and leverage technology, in an innovative way. Also with transparency towards everybody involved.

How is the GastroCampo connected to the food industry?

A digital market that connects food producers with restaurants and consumers.

Have you implemented any artificial intelligence solutions in your company today? Yes or no? If yes, what solutions and why?

No.

Why did you decide to be sustainable?

For us I would say, the main reason why we started this and the main mission is mostly from a social perspective with the belief that we as consumers, have massive power to decide what world we want to live in.

What does Gastro Campo value most in sustainable work? Why?

We want a fair system, in many aspects. If the producers are supported in producing the right way, we can keep living in the right way on the planet as well.

We have to consider how the businesses are not only affecting the environment, but the people that work behind it as well. For example a restaurant or catering business, we need to investigate whether the employees are paid enough as well, but also the other sustainable perspective regarding the impact of intensive agriculture, transport, etc.

What is your sustainable goal?

We want to involve, collaborate with associated parties in the food industry to contribute to awareness, to change the existing consumer mentality to a more responsible consumption. The vision of the startup is to collaborate.

What is stopping you from being more sustainable today?

We all have different understandings about sustainability. We have experienced that some people can react quite strongly about how to define sustainability, since people understand sustainability in many different ways. We believe that the world together has to collaborate to create and justify what sustainability actually is. For example a scale to

follow.

Even the perception of healthy food, which is very linked to sustainability but does not necessarily mean the same for everyone. For example, regarding milk as a product, one side can be from the vegan perspective, which can argue that milk is not healthy at all, while other experts can say that milk is needed for us as humans. The restaurant's perspective is that they are in between meeting the consumers' demands while also pushed by knowledge and beliefs, about whether sustainability is necessary for climate change for example. At the same time the consumer demand also includes sustainability, therefore the restaurant wants to promote themselves as sustainable as well.

More concrete this can be how they are drawn by consumer demands as a trend, for example, to eat avocado or mango. Further, the restaurants decide to follow that and buy the products from non-local producers, even though these are products produced far away, usually including bad labor conditions and they have to be imported by transportation with carbon emissions. The restaurants are then wanting to meet the consumer trend, and at the same time be sustainable.

Our perception is that most restaurants want to work towards becoming more sustainable, but are facing challenges that stop them. The reason could be the limitations of the range of local products in comparison to consumers demands(mangos or avocado as mentioned earlier), but primarily the challenge is that the restaurants don't know how and where to source these sustainable products, which is grounded in lack of time and resources.

Our experience is that there’s different types of restaurants:

- Some that are marketing themselves as sustainable, but when investigating we can find out that they’re not what they promote themselves as - for example buying importing products from far away geographically, non-organic, etc.
- Greenwashing restaurants that have a lot of knowledge and passionate employees about sustainability. For example chefs that want to buy local sustainable food because of individual beliefs. We call that the revolution of sustainability in the restaurant industry, similar to the revolution of gastronomic food and how that was a trend that grew really much. These restaurants usually turn directly to the local producers.
- Then restaurants that don’t know how to be more sustainable, and where to search for more sustainable food. They also have trouble meeting their consumers demands. The consumers don’t value the cost of food, so the restaurants can therefore have a mental perception that sustainable food is too

expensive.

How are you working with the distribution of the products from the producer? For example, are the producers responsible for the delivery, are you having a storage, or how does that work?

Delivery is the hardest part for us and we haven't figured out how to manage this in the best way yet, we're still in a testing phase but we have ideas. We are now both trying to store products and to deliver from the producers. We want to figure out a logistic system that is managing and organizing the demand and orders from consumers, but at the same time combines several orders of the same food to the same producers.

The main reason for that is the challenge regarding delivery in the food industry in Barcelona. Many restaurants don't have time and resources to search for producers, they go directly to a local producer and order from them. This is usually small quantities for each restaurant and not always profitable or sustainable for the producer. The restaurant doesn't have the money to buy a truck so the producer has to stand for the delivery. The producers are pushed to take the order, even though it maintains high costs in comparison to the order.

Out producers are local, we have some in the city, and some outside, at least 20 km away from the city of Barcelona.

You're having transparency as an approach to your business, can you tell me more about that?

The only elements we are able to use about transparency currently, is to tell the buyer/consumers of food about the producer. Further, who they buy the food from, who produced it, how it was produced and do everything to not put any barriers through that whole network. We want the buyer to be able to connect directly with the producers, which is possible today. Restaurants are really interested about the supply chains, and consumers are even more interested. In the long term, this could be done by artificial intelligence or blockchain maybe.

How do you find your local suppliers?

This is so hard. We know that restaurants want to make a difference, but it takes ages to find local producers. We have to call them, since most of them are not digitized. We

collaborate with the government that gives us some information about existing local farmers. This is again why we built this platform - so the restaurants don't have to make all this work of research.

How can you ensure their sustainable level, Do you visit them? Research? Etc?

We know 90% of our existing producers personally, so we have physically been meeting them, investigating their main elements, we have seen how they work, and then selected on different criterias. We base our decisions on:

- Research from the FAO(farming and agriculture organization) and their research about sustainability and sustainable farming.
- Investigations about the products, production, thorough meetings and research.
- Our perception of the social structure of the company, employees etc.
- Sustainable labels. The labels differ so we have to evaluate them from different aspects, for example even if a producer has an organic label, it can also mean that the labor conditions are bad.
- Integration of production/agriculture farming, for example how the producing are adapting to the catalunya laws such as zero waste.

Although our knowledge and experience, it’s still difficult to understand what actually is sustainable. We’re trying to take the decision from a consumer perspective to both meet the demand and be able to contribute to awareness of how people can consume in a more responsible way.

Appendix 4

Interview with Colibri, Barcelona

With the Co-founder Yessica González

Full interview

GDPR notice. This conversation is being recorded and the data collected can be shared both internally and externally with and without personal identifiers, you may establish any limitation to the use of the data, request statements to be off record, anonymised or to withdraw entirely from participation at any time. Do you consent to the data policy and to being recorded?

Yes

Would you mind telling me about yourself first, who you are, your work and role?

I'm Yessica González from Venezuela, I have a background in Human Resources where I have worked my whole career. Five years ago I moved to Barcelona. I thought it could be a good investment to create a store and that's how the idea of Colibri came to my mind. This was at the time around the summer of 2018 and then we started to develop the idea even more, and then we found a local in October the same year.

How is the Colibri connected to the food industry?

We sell bulk products and other products with long duration, that we mostly buy from local suppliers in Catalonia and some in Spain.

Have you implemented any artificial intelligence solutions in your company today? Yes or no? If yes, what solutions and why?

No.

Why did you decide to be sustainable?

We thought that sustainability is important which aligned with that we wanted to have proper values and mission, that contributed to a positive impact. Further, our idea was also to have as less waste as possible and follow the zero waste strategy. We also wanted

to avoid plastic, glass jars and using packaging that was easy to recycle. For example we only have 2 % products that are packed in plastic

What does the Colibri value most in sustainable work? Why?

Overall we're to avoid plastic and have as little waste from the packaging as possible, although it is impossible to not have any plastic. The plastic is hard to avoid because even if we're not selling any packages with it, some products we buy are delivered in plastic bags or similar material. Other important sustainable aspects for us is to use as many local suppliers as possible, to minimize the carbon footprint, which is why we have the majority of providers in Catalonia. In addition to that, we're only delivering our own products with public transport, to be as sustainably as possible. While expanding, the delivery of public transportations could need to be considered to another option, but it works for now and we can say that we have ECO-deliveries.

What are your sustainable objectives? Why?

We don't have any specific sustainable goal, although our mission is to reduce waste and we strive towards avoiding buying products that come in plastic, likewise an objective. We're also trying to contribute to responsible consumption and awareness about it by giving our customers discounts when bringing their own bags or jars to fill with the products they buy from us, when leaving the store. The reason for the discounts is that we wanna give our customers a reward for the effort of remembering to bring their own take-away package, which also can contribute to more changed, more sustainable, consumer behaviours. It is a win for them and for us.

Since you work towards reducing waste, are you more specifically working to prevent food waste as well?

So far we haven't had any food waste, mainly since our products are dry and not fresh food. If some products are soon to expire, we reduce the prize. We haven't had any situation where we had to throw away food. Also, indirectly we prevent food waste since all products we're selling have a long duration, which therefore can be stored longer and the chance that our customers need to throw the food minimizes.

In addition to that, I think food waste is mostly connected to transportation, which is why we're trying to only use local suppliers, also that we can prevent food waste even more by understanding the customers demands even better, and at last the food seasons better and adapt our range from that with specific seasonable products. With an

understanding for the customers and seasons, we can be more intelligent in how much food we purchase from our customers. To clarify. A bit of intelligence about when to buy and how much to buy.

How do you measure your sustainable work?

We're not measuring it today.

Since Colibri is a part of the food industry that includes several issues such as packaging, food waste, what are your biggest challenges regarding having a sustainable food supply chain?

We're not buying enough volume to have the negotiation power to change the suppliers products, for example packaging or transport, even though we're trying to push them towards it.

How do you find sustainable providers?

Some of them are recommended, and others are found by research or events for example, BIO-CULTURA, where a lot of brands that are selling eco-products promote themselves. Also, some companies visit the store and promote themselves and their products, which they want to sell to the store. Sometimes we also receive emails with requests from customers about special products or brands.

How do you make sure they're sustainable, even in their supply chain?

We have to rely on the information that they give us, for example eco-products that have labels that are developed from an agency of the government. Also, we test the products when we get them, to see the quality of the products. We can also research where the products are produced and the packaging. We already assume that work conditions are good. We don't really have a way except that.

How do you prioritize your suppliers from a sustainable perspective?

We are trying to have a balance between ECO-product and products based on the customer demand regarding price. This is because we want to be able to meet both our customers with our products, both the ones that are the types of customers are very

aware about social responsibility and sustainability, but also other customers that are thinking more about the price. On the other hand, we do know that the customer already has made a decision to pay more since their willingness to buy local produced food, before going to our store, rather than going to a bigger supermarket with lower prices. Although, if all products were ECO, we wouldn't sell all that food and therefore it wouldn't be sustainable.

How's consumers' interests about sustainability in your perception? Is that something you have measured? Both the outcome of your work from a customer perspective and the demand?

I would say our customers have a mix of a sustainable interest, sustainable consciousness and that the consumers prefer local produced food. The customers know that our prices are higher so they have already made the decision when coming to us, and they're usually aware that we're offering sustainable products.

We're not measuring the consumer's demand or how many people that buys from us. We don't have a specific measurement.