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Adapting Open Innovation Practices for the Creation of a Traceability System in a Meat-Producing Industry in Northwest Greece

Agapi Dima [1], Eleni Arvaniti [2], Chrysostomos Stylios [3,4,*], Dimitrios Kafetzopoulos [5] and Dimitris Skalkos [1,6]

[1] Computer Technology Institute and Press "Diophantus" (CTI), 26504 Patras, Greece; agapidima@cti.gr (A.D.); dskalkos@uoi.gr (D.S.)
[2] Department of Environmental Engineering, University of Patras, 26504 Patras, Greece; eleniarvanit@upatras.gr
[3] Industrial Systems Institute, Athena RC, 26504 Patras, Greece
[4] Department of Informatics and Telecommunications, University of Ioannina, 47100 Arta, Greece
[5] Department of Business Administration, University of Macedonia, 54636 Thessaloniki, Greece; dimkafe@uom.edu.gr
[6] Laboratory of Food Chemistry, Department of Chemistry, University of Ioannina, 45110 Ioannina, Greece
* Correspondence: stylios@isi.gr

Abstract: Traceability is becoming an essential tool for both the industry and consumers to confirm the characteristics of food products, leading industries to implement traceability to their merchandise. In order for the Computer Technology Institute and Press "Diophantus" (CTI) to help small and medium-sized enterprises (SMEs) implement traceability systems based on open innovation, principles were introduced. This paper presents market research that was carried out in order to determine the significant concerns of the Greek consumers about pork meat and pork products, their opinion on traceability information, and their preferences regarding how they would like to receive this information. The survey was conducted online and took place from mid-February to mid-March 2021 on a sample of 224 participants. The market research showed a very high interest concerning traceability, especially on the expiry date of the meat (87.9%), while the way and conditions of transport of the meat products follow (79%). Furthermore, consumers showed that they believe that the quality and safety of pork products would be improved with traceability (70.1%) and (79%) would prefer to buy traceable compared with untraceable pork, signifying the importance of traceability for consumers. Additionally, it was found that consumers and SMEs have common concerns regarding traceability. The information gathered from this market research will be used to adapt the traceability system to consumers' needs.

Keywords: traceability; pork meat; market research; open innovation

Citation: Dima, A.; Arvaniti, E.; Stylios, C.; Kafetzopoulos, D.; Skalkos, D. Adapting Open Innovation Practices for the Creation of a Traceability System in a Meat-Producing Industry in Northwest Greece. *Sustainability* **2022**, *14*, 5111. https://doi.org/10.3390/su14095111

Academic Editor: Filippo Giarratana

Received: 22 March 2022
Accepted: 21 April 2022
Published: 24 April 2022

1. Introduction

1.1. Traceability

In the last years, the food scandals in Europe and China unveiled the importance of an all-encompassing food traceability system. The UK mad cow disease, the 2013 horsemeat scandal in the European Union (EU), and the 2008 melamine scandal in China [1] were only a few of them and showed the need for new regulations and procedures about food fraud and food safety. Situations such as these not only erode the reputation of companies and have economic impacts [2] but can also be dangerous for consumers' health, whether they are intentional or not [3].

Food traceability is the ability to access specific information about a food product that has been captured and integrated with the product's recorded identification throughout the supply chain.

In any case, traceability refers to a system that can continuously track a food product and its history and location. The main principles of traceability were defined by Codex Alimentarius Commission (CAC) as the ability to follow the movement of a food through specified stage(s) of production, processing, and distribution [4]. This is one of the main definitions but several others have been proposed depending on standardization, organizations, legislations, and the academic literature [5].

Practically, a system such as this encompasses the creation of identification for each product in all the stages of the supply chain (farm to fork). This ID is coded on the product and corresponds to a file containing information about the history of the product and its components, both in the previous and next stages of the chain (sequential traceability) and in the current stage (internal traceability).

Traceability shows the complete history of the product, which is very advantageous, especially during crisis management, as a defective product can be located and recalled at any step. Furthermore, traceability can also provide information that allows better control of all the processes (e.g., optimal use of raw materials, inventory control, production planning, troubleshooting should an issue arise, quality control, etc.). Traceability can also be used at any time in order to substantiate the company's claims about the characteristics of its products (e.g., quality, origin, GMOs, etc.) [5–8].

Obviously, an effective traceability system must be very complex to include all the information needed for each product and all the procedures for making said product. However, it is difficult for small and medium-sized enterprises (SMEs) to implement a traceability system on their own, mainly due to lack of funds or know-how [9].

Traceability systems are also critical in terms of commerce. An implemented traceability system can allow seamless global trade of products that have verified origins [10]. The EU, China, Canada, India, and other countries heavily promote traceability. However, since there will inadvertently be variations of what these traceability systems contain due to differences across geographies, cultures, and products, there is a need to make traceability components compliant with standards shared by all partners, which will, in turn, make it easier to share and compare information [10]. Recently, consumers' perception of Greek traditional foods using variables related to package, product, quality, process, and personal information was investigated [11]. The results show that consumers considered questions on package information "quite important" and "very important" by an average of 68%, on food information by 64%, on quality information by 69%, on the production process by 78%, and on personal information by 65%.

Many different techniques have been used to prove traceability and food authenticity. Analytical methods such as GC, HLPC, and several spectroscopic and DNA analysis techniques are being used to confirm traceability and determine if a product has been adulterated [12,13].

The leaps made in technology have helped to overcome several issues concerning traceability. For example, portable spectroscopy devices can provide rapid, on-site, easy-to-use, and cost-effective food analysis throughout the whole food supply chain. Furthermore, blockchain technology could improve traceability throughout the entire supply chain combined with other approaches. However, such platforms are impossible to be used in several parts of the world. If digitization is not advanced enough, and is not in many instances, any potential system will be unavailable and unusable to companies and end-users alike [14]. Cell phones have abilities that can be used to make traceability more efficient and make traceability information more available to consumers. By scanning a code (QR code, bar code, etc.) or using NFC technology, consumers can trace information and can be easily connected to databases that have all the available information (food origin, feeds, and date of slaughtering for meat, pesticides that were used on fruits and vegetables, etc.) from the point it was produced to the point of sale [15].

There is also a high interest in specifically implementing blockchain in traceability systems. It has been shown that blockchains and other distributed ledger technologies can help implement traceability and sharing of information for small and medium enter-

prises [16]. Blockchain's capacity of irreversibly storing data, as well as other features it has, has shown promising results as it can create a secure string of information that can be shared with everyone (industry, consumers, and authorities) [17]. However, as of now, only a few programs have been launched concerning traceability, making it too soon to tell whether this is something that will be genuinely beneficial to the industry as well as consumers [18,19]. Furthermore, many challenges need to be addressed as to how an implementation such as this one will happen [20], considering it requires costly infrastructure changes [21].

Nevertheless, some severe issues concern consumers and the meat-producing industries considering meat traceability. As of now, there is no unifying framework concerning meat traceability, which leads to confusion as different principles and guidelines exist simultaneously [22]. However, to this end, new research efforts are being made so that all participants follow the same procedures, while new flexible and user-friendly traceability systems are also being proposed [6,22,23].

1.2. Current Status of Pork Production in Greece

Pork meat consumption fluctuates annually in Greece. Consumption fell slightly by 7.3%, reaching 884 thousand tons in 2017, remaining almost at the same level as in 2016. The degree of self-sufficiency in the domestic meat market has remained stable at about 52% over the last five years [24].

Pork outperforms consumer preferences over other types of meat:

- The per capita consumption of pork has remained stable at 27.2 kg/person in recent years;
- Poultry meat follows, with an annual per capita consumption of 26.9 kg/person in 2017;
- Beef/veal (15.4 kg/person);
- Sheep and goat meat (6.8 kg/person).

Pork consumption amounted to 292.5 thousand tons in 2017. A percentage of 53% of the pork in the domestic market was imported from 2013–2017. On the other hand, pork-meat exports were very limited, covering only 9–11% of production. The degree of self-sufficiency in pork has shrunk by 9% over the last seven years [24].

1.3. Open Innovation

SMEs have limited resources and capabilities, which restricts them significantly [25]. This can be helped by implementing open innovation to provide a viable solution. Open innovation is a relatively new term; it first appeared in the 2003 book of Chesbrough, and it proposed that companies combining internal and external ideas when innovating would benefit more than by adhering to the traditional research and development model [26]. The prevailing definition for open innovation is purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation, respectively [27]. This means practically that, instead of a closed-off research and development process with an in-house team, collaborations are promoted between different partners combining forces. As a result, diverse collaborators such as companies, research centers, universities, and even people working on the project have a positive effect as the different perspectives and backgrounds of everyone involved lead to the creation of better products, services, or research [28].

The research institutes participating in open innovation reaped many benefits as it was found that it strengthened the position of the public research institute, increased internal networking, and broadened and improved the capabilities and knowledge of the involved researchers [29]. Furthermore, research consistently shows that open innovation has been beneficial to firms that have used it [30]. More specifically, there have been many success stories when open innovation was used in the food industry, creating fascinating results [31].

As new technology appears to need multidisciplinary development, open innovation can help, as a single organization struggles to provide what is needed, especially if it is a smaller one [32].

For a successful open collaboration to provide the necessary results, finding the right partners for the project is vital. Computer Technology Institute and Press "Diophantus" (CTI) was approached for this project. CTI Diophantus has the know-how to create and implement a complete traceability system. This system will allow consumers, using various types of smartphones, etc., to access all information available for the products through an integrated data center.

This collaboration is beneficial as an SME would not have been able to spend funds and time to create or license a traceability system just for themself. On the other hand, CTI Diophantus can further proceed with the research work created from all the steps towards implementing the traceability system in real life. This is quite significant, as SMEs are usually more directed to using open innovation during the commercialization and seldom during the research phase, as in this case [33].

The first step in this direction was conducting market research concerning pork, pork products, and the information available to consumers through traceability. This market research was critical for the next steps, especially since there is a substantial lack of research concerning the consumer behavior toward pork meat and pork meat products [34].

1.4. Aim of the Investigation

This work aims to study and analyze the data collected, obtain some insights into consumers' preferences and identify opportunities or problems that could be present through the implementation and use of the innovative traceability system. More specifically, this market research examined:

How important it is for the consumer to know specific information about pork meat and pork products that can be provided through traceability.

How consumers think that traceability will affect the pork-producing industries in terms of quality and safety.

How consumers think that traceability will affect their buying habits concerning pork and pork products.

How consumers prefer to receive traceability information.

Besides identifying consumer trends concerning pork meat and products, this market research will also be used to improve the corresponding traceability system. Using this information about what consumers want to know about the products' characteristics/quality, the traceability system will be adapted accordingly. In conclusion, besides identifying consumer trends, the market research helps define the requirements and standards that the Integrated Traceability Information System will have.

2. Materials and Methods

2.1. Research Methodology

The survey took place from mid-February to mid-March 2021. The survey was conducted online and shared on social media for maximum exposure. In total, 224 questionnaires were completed by all age groups and by both sexes. The participants originated from the regions of Western and Central Macedonia. In addition, data about how a traceability system would affect an industry were collected from pork-meat and pork-product producing SMEs. These SMEs incorporate several stages of the supply chain that are of interest in this study.

An interview protocol was developed from which the collection of information was based. Data analysis was performed using the IBM Statistical Package for Social Sciences (SPSS) for Windows, version 24 (SPSS Inc., Chicago, IL, USA)

The present research results could be a starting point for further future research on the same topics.

2.2. General Information

The data of the replied questionnaires were gathered and then processed using SPSS, version 24. The first six questions were introductory and contained demographic questions (gender, age, educational level, personal income, and marital status) and pork frequency consumption status.

The next three sections included only multiple-choice questions with a single answer option. The first one was to describe how important consumers deemed information about pork meat that can be provided through traceability (questions 1–16). All questions of the first section were drawn up following a scale of seven points: 1 = Definitely unimportant; 2 = Probably not important; 3 = Slightly important; 4 = Maybe important; 5 = Probably important; 6 = Very important; 7 = Definitely important. The second section focused on identifying how the public reacts to the traceability information provided for the sold pork.

All questions of the second section were drawn up following a scale of seven points: 1 = Definitely not; 2 = Probably not; 3 = Maybe not; 4 = Maybe; 5 = Maybe yes; 6 = Probably yes; 7 = Definitely yes. The last section was about the preferred ways consumers could access traceability, and three different ways were presented to consumers.

3. Results

3.1. Profile of the Sample

As shown in Table 1, most of the participants were women (75%). This is mainly because women are more sensitive and interested in health and nutrition issues as they are the primary household decision makers, and consequently were more responsive to the research.

Table 1. Sociodemographic profile of the sample, N = 224%.

Variable	Groups	(%)
Gender	Male	25
	Female	75
Age	18–30	17
	31–45	21.4
	46–55	42
	>55	19.6
Educational level	High school	34.8
	University	58.9
	Postgraduate	6.3
Personal monthly income EUR	<500	9.8
	500–1000	29.9
	1000–1500	25.9
	1500–2000	18.8
	>2000	15.6
Marital status	Single	17.4
	Married	75.9
	Divorced	4.9
	Widowed	1.8
Pork consumption frequency	twice a week	18.8
	once a week	68.3
	once or twice a month	12.9

As for the ages of the participants, it was found that people of all ages completed the questionnaire. A total of 17% of the participants were 18–30 years old, 21.4% were 31–45 years old, 42% were 46–55 years old, and 19.6% were over 55 years old. Therefore, the most significant sample of consumers who replied to the questionnaire was the 46–55- year-old one.

As for the participants' level of education, 34.8% have a high school diploma while a 58.9% have a university degree, and only 6.3% have a postgraduate degree.

When asked about their marital status, 17.4% stated that they were single, 75.9% stated that they were married, 4.9% were divorced, and finally, 1.8% of the participants stated that they were widowed. Therefore, the majority of those that participated in the survey were married.

The participants were also asked to declare their monthly family income (euros). In total, 9.8% of the participants answered that the monthly family income is fewer than EUR 500, 29.9% answered EUR 500 to 1000, 25.9% said EUR 1000 to 1500, 18.8% answered from EUR 1500 up to 2000, and finally, only 15.6% answered higher than EUR 2000.

The responses about pork consumption frequency showed that the most significant percentage of consumers (68.8%) consume pork once a week, followed by a smaller percentage (18.8%) who consume pork products two or more times a week, and an even smaller percentage (12.9%) of those who consume pork products 1–2 times a month.

3.2. Correlation between Socio-Economic Profile and Preference for Traceable Pork

Chi-square tests were performed on the data received to observe correlations between the socio-economic profiles of the participants and their answers given on Q22 (Would you prefer to buy pork that is characterized by traceability over some other not traceable meat?). The statistical evaluation was performed specifically for this question as it was deemed the most important of all the research as the answers received showed the importance that traceability has on consumers' buying habits.

By administering a chi-square test using SPSS on the data, it was found that:

- The sex of the participants did not have any bearing on pork consumption (p-value = 0.640 at a significance level of 5% (but also at 1% and 10%)), meaning that both sexes choose to buy traced pork with equal probability, i.e., the variables are unrelated to each other.
- The age of the participants also did not have any bearing on pork consumption. (p-value = 0.381 at a significance level of 5% and 10%). Therefore, the probability of buying traced pork by age group is the same, i.e., the variables are not correlated. This result is to be expected, as pork is a food that is enjoyable for all ages.
- The same goes for marital status. The chi-square test shows that statistically there is no significant difference between the marital status of the respondents (p-value = 0.951) at the significance level of 1%, 5%, and 10%. Consequently, the probability of buying traced pork does not depend on marital status, i.e., the variables to be examined are not related to each other.
- Monthly income was also examined. The chi-square test showed no correlation between income and the probability of buying traced pork (p-value = 0.765) at a significance level of 5% (and at 1% and 10%).
- Education was also irrelevant concerning whether or not to buy traced pork (p-value = 0.665 at a significance level of 1%, 5%, and 10%.)

The chi-square test administration demonstrated that all these characteristics of the participants were irrelevant to the purchase of traced pork.

3.3. Traceability and Consumers

In the next part, consumers' responses to the questions about traceability are examined.

The first set of questions was about which information would be essential about the pork on sale and if technology could be used to access it.

By examining Table 2, several findings come to light concerning what information consumers deem necessary concerning pork meat and pork-meat products. The country of origin of the pork (Question 1) was important to most consumers (69.2%).

Table 2. Answers about the importance of the information that can be provided through traceability, N = 224%.

If You Were Given the Opportunity to Use Technology to Get Information about the Pork You Are Buying, How Important Is It for You to Know:	Definitely Not Important	Probably Not Important	Slightly Important	Maybe Important	Probably Important	Very Important	Definitely Important
	1	2	3	4	5	6	7
1. The country of origin	3.6	7.1	7.6	12.5	14.7	22.8	31.7
2. The name of the pork-producing unit	4	9.4	10.3	15.2	16.5	21.4	23.2
3. Information about raising the animal e.g., type of feed, rearing method (free-range, organic)	0.9	2.2	1.8	1.3	4.9	33.9	54.9
4. Information about the hygiene and health of the animal before slaughter e.g., animal husbandry conditions, administration of antibiotics or other drugs	0	0.4	0.9	0.4	4.9	29.9	63.4
5. The country and date of slaughter	0	1.8	1.8	1.8	11.2	34.4	49.1
6. The age of the animal at slaughter	0.4	2.7	6.7	13.8	20.1	29	27.2
7. The date of processing of the carcass	3.1	8	10.3	17	20.1	22.8	18.8
8. The results of chemical and/or microbiological tests	1.8	3.1	5.4	9.8	15.2	15.6	49.1
9. The place and storage conditions of meat products	0	0.4	1.8	1.8	9.8	15.6	70.5
10. The manner and the conditions of transport of the meat products	0	0	0.4	1.3	6.3	12.9	79
11. The date the meat products were received by the final retailer e.g., supermarket, butcher	0	0.9	4	8.5	15.6	23.7	47.3
12. Freezing date and freezing conditions of frozen pork products	0.9	0.9	2.2	4.9	11.6	16.1	63.4
13. The date and conditions of packaging of fresh pork products	1.3	2.7	4.9	8.5	13.4	15.6	53.6
14. The expiry date of the pork products	0	0	0	0	3.1	8.9	87.9
15. The results of inspections made by the appropriate health services	0	0.9	1.3	3.1	6.7	14.3	73.7
16. Information on the implementation of food safety and hygiene system (ISO 22001 or quality (ISO 9001)	1.3	3.6	3.6	8	12.9	16.1	54.5

It is also made apparent that information about how the animal was raised (Question 3), its hygiene and health, and the drugs it was administrated (Question 4), as well as the date and place of slaughter (Question 5), was of very high importance to consumers, as they answered that is probably to definitely important in percentages of 93.7%, 98.2%, and 94.7%, respectively. It is also exciting that the percentages that considered this information definitely important were also very high (54.9%, 63.4%, and 49.1%, respectively).

The information that was deemed the most important for the consumers that participated in the survey was the expiry date of the meat (question 14 with 87.9%), with the manner and conditions of transport of the meat products coming second at 79% (question 10).

However, it was made apparent that the participants do not attach much value to the name of the livestock unit or the animal's age, as long as the veterinary tests have confirmed the safety of the meat. Moreover, this information was not very useful for quality and safety systems implementation.

As shown in Table 2, consumers consider the content of the questions very important. This can lead to the assumption that a traceability system that efficiently provides all this information would be helpful and necessary.

Figure 1 shows the answers about which information was the most important for consumers. Consumers expressed high interest in learning information about the way and the conditions of transport of the meat products, the expiry date of the pork products, and the results of inspections made by the appropriate health services.

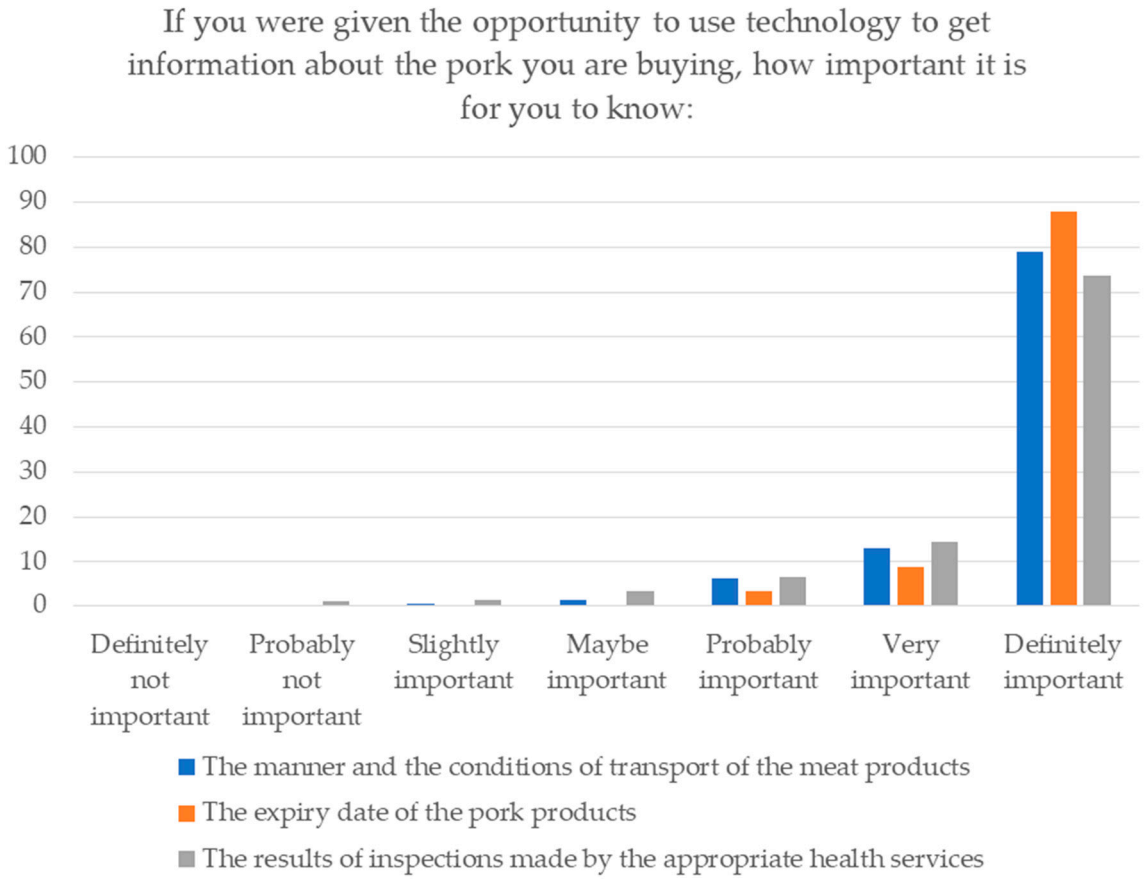

Figure 1. Consumers' trends concerning information about the hygiene of the animal, the transport, and the expiry date of the pork products.

In Table 3, the answers about how consumers think that traceability information would affect the pork meat industry and their consumer habits are shown.

A total of 70.1% of the participants believe that the quality and safety of pork products would be improved with traceability, and 79% would prefer to buy traceable pork compared with untraceable pork.

It also appears that consumers consider that traceability has significant benefits in improving the public confidence concerning pork meat products (40.2%), reducing the consumption of unsuitable products (39.3%), making the quality–price comparison better (34.2%), and protecting public health (percentage 33.0%). It is also important to mention that only a meager percentage of the participants answered that traceability would not substantially impact the pork they are buying (less than 10% on most questions).

In Figure 2, it can be seen more clearly what consumers consider will change due to traceability. As said before, they believe that the safety of the products will be improved, the risk of consuming unsuitable products will be reduced, and they will prefer traceable meat over untraceable. It is also observed that only a fraction of consumers thought that traceability would have little effect on the products or their shopping habits. This shows that the public has a high interest in pork and pork-product traceability.

Table 3. Public perceptions about how meat traceability will affect consumers. N = 224%.

If You Have the above Information about the Pork You Are Buying, Do You Consider That:	**Definitely Not**	**Probably Not**	**Maybe Not**	**Maybe**	**Maybe Yes**	**Probably Yes**	**Definitely Yes**
	1	2	3	4	5	6	7
17. Would the quality and safety of pork products be improved with the use of traceability?	0.4	1.3	0.9	4	9.8	13.4	70.1
18. Would your confidence in the hygiene and safety of pork products increase?	0	1.3	2.7	8	15.6	32.1	40.2
19. Would public health be more effectively protected?	0	0.4	2.2	5.8	21	37.5	33
20. Could you make a better quality–price comparison?	0	3.1	3.6	7.1	18.3	33.5	34.4
21. Would the risk of consuming unsuitable products be reduced?	0.4	1.3	2.2	11.2	11.6	33.9	39.3
22. Would you prefer to buy pork characterized by traceability over some other not-traceable meat?	0	0	0	3.1	4.9	12.9	79

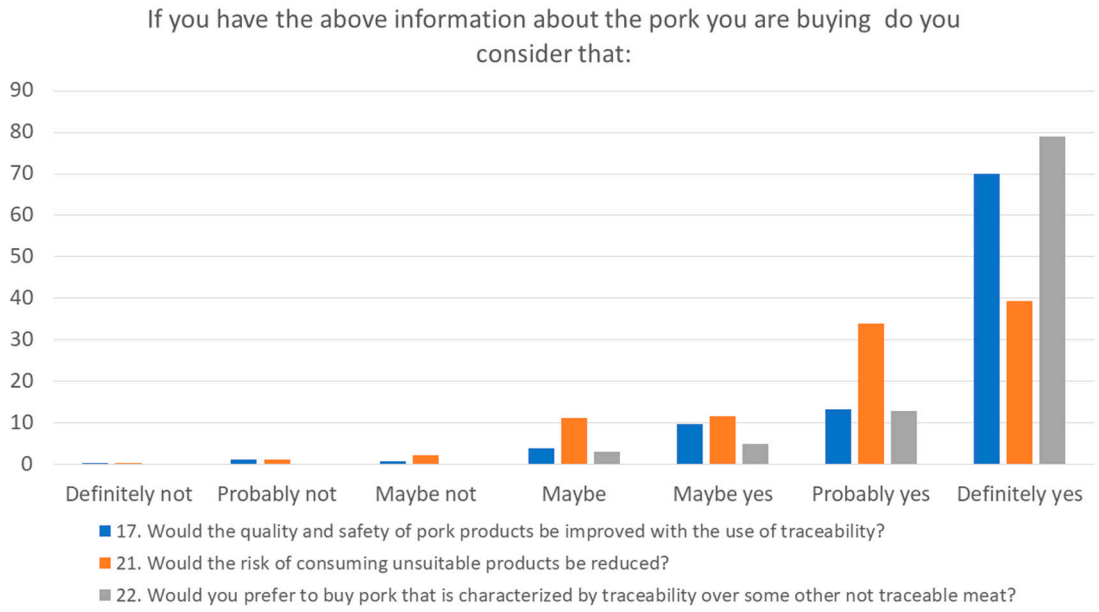

Figure 2. Consumers' perceptions about the effects of traceability information.

3.4. Methods of Receiving Information

The responses considering the means of providing traceability information to consumers were quite interesting. As seen in Figure 3, most consumers prefer a screen in the marketplace providing this information, with the mobile app as the second choice. This can be explained by the need of consumers to be provided with traceability information as they are trying to select which pork products to buy. Visiting the company's website is the least preferred method, even though it is a choice that is accessible 24 h a day, seven days a week.

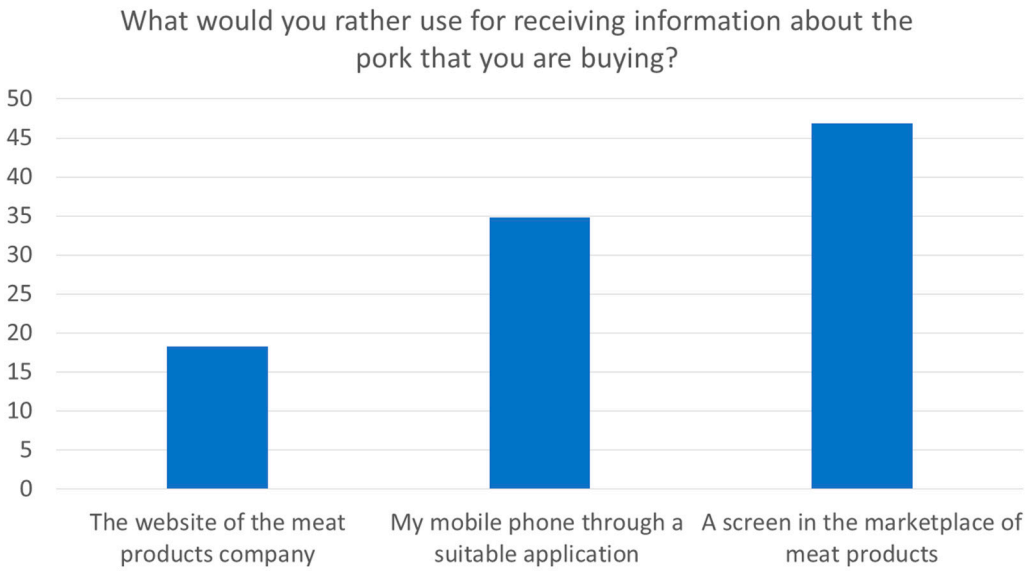

Figure 3. Consumers' preference for receiving traceability information about pork.

Consumers seem to prefer the informational screen in the market as it is a direct method to provide information that they are already familiar with.

3.5. SMEs and Traceability

A pork and pork-product-producing SME was selected to gain useful information about the factory plant and the conditions the pigs were raised in, the logistics, and other details that would affect traceability. The piglets are born by sows and are raised on the farm. After weaning, they are transferred to stables. They are fed with the appropriate food for about 5.5 months before being led to the slaughterhouse during their stay there. Every month, a veterinary inspection is conducted certifying the health of the animals and recording the condition of the animals, their vaccinations, possible diseases, treatments, etc. These inspections are of the utmost importance. Deworming is also conducted regularly at the stables.

The type and quality of feed are determined on an annual basis. Feed samples are tested for antibiotics, aflatoxins, etc., by the incharge health services. Possible modification of the feed composition is determined according to the cost and the content of nutrients. The incharge health department also carries out a veterinary check during the slaughter of animals.

Storage conditions (temperature and humidity) are considered necessary for the safety of the products and the delivery date to the retailer. The slaughter date and expiration of meat products are also considered essential for ensuring their safety. The meat is transported to the retailers by privately owned refrigerator trucks, in which the necessary transport conditions are observed. The trucks are maintained regularly, and their temperature and hygiene are checked before loading them with products.

The information that was considered most important by the SME and is concerned with the traceability system is:

- The use of a code to identify each pork product or with the use of a batch number for all the animals;
- The health of the animal and the hygiene of the carcass, which is ensured by the necessary veterinary checks, under the responsibility of both the appropriate health authorities and as well as the company;
- The breeding of the animal with nutritious and safe feeds;
- The yield of useful meat by measuring the initial weight of the animal, the breeding time, the weight before slaughter, and the weight of the useful meat;

- The storage conditions of the meat products before they are sent to the retailers and the date they received them;
- The expiration date indicated on the packaged products is data that certifies that the distributed products are safe for consumption.

As the market research showed, there is a high overlap between what the enterprise and consumers deem essential information about meat and meat products.

As for the advantages of the application of the advanced traceability system, it has been determined that there will be many benefits that help the company in many ways, such as:

- Standardizing procedures and having more effective overseeing of the overall process.
- More effective monitoring will help in troubleshooting and lead to immediate problem management, minimizing the number of errors associated with all stages of production. This also minimizes the creation of problematic and /or unsafe batches and makes them more easily identified and withdrawn.
- Livestock management will also be more effective, leading to a higher meat yield, resulting in increased productivity.

Furthermore, the production of safe products will be ensured, resulting in increased consumer confidence and reduced complaints. This leads to increased sales and, therefore, more revenue. Moreover, monitoring and evaluating suppliers with this system makes it easier to guarantee the future purchase of healthy animals.

Consequently, it is determined that integrating the innovative traceability system provided by CTI Diophantus is in the company's best interest.

4. Discussion

Analysis of the Results of the Market Research

By presenting market research results, useful conclusions can be extracted from consumers' preferences concerning pork meat and its products. This can be of great insight to any company concerning their products. In total, 68% of consumers have pork once a week, which means that this meat is an integral part of their diet, and there is a relatively large sample in this category for the preferences of consumers to be reliably exhibited. Moreover, since the risk of consuming inappropriate products is high, the company should have the appropriate tools to manage possible incidents concerning the meat produced and its meat products. An advanced innovative meat traceability system based on RFID technology that can be used with HACCP implementation can help with these incidents and create a framework for traceability for pork or pork-meat products [22]. Considering all the above, the proposed advanced innovative traceability system will help supply-chain members upload the information they want or need to share with the relevant authorities or consumers and have the traceability information stored in a form that can serve this purpose.

Another significant finding from the market research is that most consumers prefer pork products with traceability information (90%). This should push pork-producing companies to invest directly in the innovative advanced traceability system. It would fulfill consumers' need and requirement to access the information on the pork products they buy, benefiting both consumers and businesses. Increased sales offset the investment costs due to increased consumer confidence, as the end-user is provided with safer products of higher quality. This research results also show that consumers would like to learn as much information as possible about meat products. Additionally, consumers show interest not only in specific traceability information, but in the entire life cycle of meat products, from animal husbandry to the final products that come into their hands, giving more importance to meat safety (expiry date, storage conditions, and country of origin) and meat hygiene (results of tests by health services, results of chemical and/or microbiological tests, and information on the health and breeding of the animal). Furthermore, even though the legislation in the European Union is considered complete and covers all stages of the supply chain, there is not a standardized way of recording all this information, leaving companies on their own to decide the best way to record the necessary information in a manner so that

it can be available if needed. By implementing a traceability system, the company gains all the previously established benefits and a competitive advantage against other companies that do not possess one.

As mentioned before, an SME would have been unable to perform the task of implementing a new traceability system on its own, and this is why open innovation was used. In this case, the utilization of open innovation does not stop after installing the system. The means (mobile apps, site, and screen in the market) used for communicating the information to the consumer can create ways of interaction between consumers and the company. This way, consumers are able to send feedback to the company, state their preferences, review the products, and even send ideas for new products.

5. Conclusions

In this market research, Greek consumers and their behavior towards pork meat and pork products was examined, as well as the information pertaining to these products. This information was used to see consumers' attitudes about pork meat and pork-meat products and their interest in traceability and the information they would like to be available regarding said products. The research showed that consumers are very interested in the information provided to them and that it can affect their buying habits to a high degree. This high interest showed that a traceability system would benefit the company by giving it an edge in the market. Furthermore, it is shown that between an SME and consumers, there is a very high overlap regarding the information about pork and pork products that they both consider of high importance, and that by implementing a traceability system, this information can be provided to them both.

Author Contributions: Conceptualization, A.D. and E.A.; methodology, A.D. and E.A.; validation, A.D., E.A. and C.S.; formal analysis, A.D. and E.A.; investigation, E.A. and D.K.; resources, E.A. and D.K.; data curation, D.K.; writing—original draft preparation, A.D. and E.A.; writing—review and editing C.S. and D.K.; visualization, A.D.; supervision, C.S.; project administration, C.S. and D.K.; funding acquisition, C.S., D.K. and D.S. All authors have read and agreed to the published version of the manuscript.

Funding: "This research is funded by Operational Program of Region of Western Macedonia 2014–2020 under the project "Ko-MEAT-IT: Developing a modern system of advanced traceability of the Kozani meat to improve productive performance, quality and hygiene using intelligent information systems" cofinanced by the European Union—European Regional Development Fund (ERDF) and National Resources.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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