Can Blockchain Meet Irish Consumers' Increasing Demands for Food Safety, Sustainability, and Ethical Sourcing?

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Project Submission Sheet

Student Name**:**   Roxana Tatoiu

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Full transparency and traceability are emerging as essential factors in modern supply chain management, allowing businesses to meet growing consumer concerns about food safety, ethical sourcing, and sustainability. According to Duan et al. (2020), the global food chain is a complex web of interconnected links that includes farming, processing, distribution, and consumption. Each connection has potential risks that must be carefully managed. Within this context, transparency refers to making supply chain operations visible and accessible to all stakeholders, whereas traceability allows stakeholders to trace product origin, history, and trajectory, allowing consumers to make more informed decisions and increasing trust in the integrity of the food supply chain (Ding et al., 2024).

Traceability and transparency are becoming crucial in managing modern supply chains, assisting businesses in addressing rising customer concerns regarding food safety, responsible sourcing, and ecologically friendly practices. Duan et al. (2020) explains that the global food supply chain is a complex system of interrelated links that include farming, processing, distribution, and consumption. Each of these connections poses certain risks that require proactive management. Within this context, transparency refers to making supply chain operations visible and accessible to all stakeholders, whereas traceability allows stakeholders to trace product origin, history, and trajectory, which in turn empowers consumers to make informed decisions elevating their trust on the integrity of the food supply chain (Ding et al.,2024).

Transparency initiatives provide significant internal and external

Select keywords

supply chain   full transparency   Duan   Ding et al.   Montecchi et al.

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Abstract

The aim of this research is to investigate whether blockchain can meet Irish consumers growing demands for transparency, sustainability, and ethical sourcing in the food supply chain. Blockchain has emerged as a potential tool for enhancing trust in the food supply chain due to its potential to offer greater transparency, traceability, and food safety to reduce modern supply chains vulnerabilities such as food fraud, contamination, and health concerns. The research employed a quantitative research design using an online survey that was distributed through social media to Irish consumers who engage actively in food purchasing and gathered 110 valid responses. The questions were divided into four different themes, each related to a different hypothesis that was relevant to answering the research question.

The findings revealed useful insights about Irish consumers' attitudes towards blockchain potential in the food supply chain. Hypothesis one and two rejected the null hypothesis, as there was a statistically significant positive relationship between

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Abstract

The aim of this research is to investigate whether blockchain can meet Irish consumers growing demands for transparency, sustainability, and ethical sourcing in the food supply chain. Blockchain has emerged as a potential tool for enhancing trust in the food supply chain due to its potential to offer greater transparency, traceability, and food safety to reduce modern supply chains vulnerabilities such as food fraud, contamination, and health concerns. The research employed a quantitative research design using an online survey that was distributed through social media to Irish consumers who engage actively in food purchasing and gathered 110 valid responses. The questions were divided into four different themes, each related to a different hypothesis that was relevant to answering the research question.

The findings revealed useful insights about Irish consumers' attitudes towards blockchain potential in the food supply chain. Hypothesis one and two rejected the null hypothesis, as there was a statistically significant positive relationship between blockchain awareness among Irish consumers and its perceived usefulness for enhancing transparency in the food supply chain, as well as consumers who value sustainability and ethical sourcing, who are more likely to pay a premium for food products if blockchain guarantees their ethical sourcing. While hypotheses three and four revealed that there is not a significant relationship between blockchain awareness levels among Irish consumers and their perception of it as a main barrier to adoption, nor between Irish consumers trust and their opinion on whether blockchain is more necessary for imported products, failing to reject the null hypothesis and challenging this researcher's assumption that Irish consumers would see blockchain as unnecessary for locally produced food.

Overall, despite moderate awareness of blockchain potential in food supply chains, the results indicated that Irish consumers are open to technologies like blockchain that can enhance food safety, transparency, traceability, sustainability and ethical sourcing in the food supply chain. This study concludes that while blockchain can meet evolving consumers demands, there are many concerns and potential barriers to adoption that must be addressed before its implementation. Its success lies in how well its benefits are communicated and adapted to local realities.

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1. Introduction

The global food supply chain has become an ongoing debate among scholars, particularly for concerns as complexity grows due to globalisation and changing consumer expectations. As Singh et al. (2022) argue, the interrelated nature of today's supply chains has increased vulnerabilities such as food fraud, contamination, and unethical practices, as seen in recent incidents like the operation OPSON in 2024, which discovered 11 criminal networks involved in counterfeit products and expired food reintroduced to the market with falsified labels, which led to the seizure of 22,000 tonnes of fraudulent food worth €91 million across Europe (Henderson, 2024).

Food supply systems are becoming increasingly vulnerable, as seen by numerous food product recalls that have happened, particularly due to contamination. These issues have not been handled effectively by traditional systems, which raises doubts about how well they can guarantee trust, food safety, and transparency. This is also extremely significant since consumers preferences have evolved and are continually evolving. A recent global survey indicated that 93% of people believe it is vital to know what is in their food, where it comes from, and how it is produced (McMullen, 2024). People are no longer only concerned with pricing or taste; they also want greater transparency, sustainability, and ethical sourcing.

Ireland, despite a small population of around 5 million, represents an interesting case within the global supply chain context. It is considered a global agrifood powerhouse that exported €18 billion in agri-food products to 180 countries in 2023 and imported €13 billion, a 68% increase since 2014 (IFAC, 2023). Ireland's reliance on exports and imports creates risks such as contamination, food fraud, and unethical sourcing, which may impact consumer trust both locally and globally.

In Ireland, recent public health concerns make it even more important to have more trustworthy food supply chains. The rise in ultra-processed food consumption, which makes up about a third of an Irish person's daily calorie intake. This kind of food is connected to health problems such as type 2 diabetes and heart disease (O'Regan, 2024), with experts projecting that by 2060, 88% of the Irish people may be at danger of becoming obese (RTÉ, 2023), requiring immediate action.

Within this context, blockchain technology has emerged as a viable answer to these problems by giving customers real-time, verifiable information about where their food comes from and what nutrients it contains, which may encourage them to make better choices. Martínez-Castañeda and Feijoo (2023) say that blockchain might change food supply chains by making sure that products are real, reducing fraud, and making operations more efficient. Cultural factors also make the promise of blockchain in Ireland even more clear. A PWC survey found that 70% of Irish customers are prepared to pay more for products that are sustainable, while one in every two would pay up to 10% more for products that are ethically produced. Blockchain has the potential to verify data about sourcing, production, and distribution, all of which could meet these consumer needs and give businesses a chance to build trust and engagement.

Walmart's partnership with the IBM Food Trust blockchain platform, which keeps track of more than 25 products from farm to shelf, and Carrefour's use of blockchain QR codes to give customers more information about products like chicken, milk, and vegetables are two examples of how blockchain can be used in the food supply chains. These examples underscore that blockchain is not only viable but increasingly scalable.

In addition, blockchain's immutable records also have the potential to mitigate widespread concerns about fraudulent labelling or counterfeiting, particularly with goods labelled as organic, fair trade, or locally sourced, as more brands are increasingly adopting them. Blockchain can allow consumers to confirm these claims, as Singh and Sharma (2022) claim that blockchain can verify sustainability claims and provide verifiable proof of environmentally favourable operations. Blockchain enables producers and retailers to link those claims with immutable records such as certification documents and third-party audits. Blockchain can allow manufacturers and retailers to connect such claims to records that cannot be altered or changed, including certification credentials and audits conducted by third parties. Blockchain can allow manufacturers and retailers to connect such claims to records that cannot be altered or changed, including certification credentials and audits conducted by third parties. For example, IBM Food Trust enables businesses to add environmental or social certifications to a product's digital history. This makes it easier for customers to check claims about sustainability (IBM, 2024).

Blockchain has many benefits, but it also faces adoption challenges, particularly such high prices, concerns about scalability, and a lack of understanding among consumers (Tripathi et al., 2023; Cozzio et al., 2023). Because of these challenges, it is necessary to look more closely at how Irish people see blockchain's potential, taking into account Ireland's particular cultural and economic situation. Cultural barriers such as high trust in locally produced and traditional body standard certification further complicate its adoption. Therefore, investigating and understanding consumers perceptions in specific cultural contexts such as Ireland becomes key to blockchain's potential success in food supply chains.

This research adopts an ontological position based on a critical realist paradigm, recognising that while consumer attitudes and behaviours such as awareness, perceptions, and desire to adopt blockchain technology are quantifiable, they are also shaped by different sociocultural dynamics unique to each setting (Bhaskar, 2008). This underscores the importance of localised research, in line with Xing and Jin's (2023) argument that these attitudes and behaviours are influenced by one's own cultural, social, and economic aspects. This research focuses on Ireland's specific conditions to explore Irish consumers attitudes towards blockchain's potential in the Irish food supply chain.

The research uses quantitative methods aimed at exploring Irish consumers' sentiment towards blockchain, with a questionnaire that addressed four different themes aimed at answering this research's question, *"Can blockchain meet Irish consumers' increasing demands for food safety, sustainability, and ethical sourcing?"* The sample targeted was Irish consumers who engage actively with grocery purchasing.

 The study examines the following:

- The relationship between blockchain awareness and perceived usefulness.
- The willingness to pay a premium if blockchain guarantees sustainability and ethical sourcing claims.
- The relationship between limited awareness as the main barrier to adoption.
- Examine whether the assumption that Irish consumers trust in local products perceives a greater need for blockchain verification in imported products than domestic ones.

By investigating these themes, this research aims to answer the question while adding to the larger academic debate on blockchain adoption and providing helpful insights for policymakers and businesses to develop tailored strategies for improving the food supply chains.

1.1 Research Structure

This research is organised in six main chapters, each aimed at addressing key elements of the research process and contributing to the overall objectives.

1. **Introduction**

This chapter outlines the background, rationale and structure of the research, providing the basis that explains the motivation of the study and its relevance in exploring Irish consumers attitudes towards blockchain use in the food supply chains.

2. **Literature Review**

This chapter focuses on reviewing the existing academic and industry literature relevant to the research scope. It analyses diverse scholars' arguments about blockchain's potential, challenges, and consumers sentiments towards it, offering the foundation that would be used throughout the study.

3. **Research Question**

In this chapter the research question is provided along with the hypothesis and themes linked to them, along with the research's objectives and providing the rationale behind it.

4. **Methodology**

This chapter discusses the philosophical assumption, research design and survey construct. It explains the sampling strategy, methods used to collect data, and data analysis techniques along with ethical considerations and limitations.

5. **Data Analysis and Findings**

In this chapter the hypotheses results are tested, analysed and discussed.

6. **Discussion and Conclusion**

The final chapter discusses the findings considering the literature and how it contributed to the broader academic debate about blockchain use in food supply chains and offers recommendations for future research.

2. Literature Review

2.1 The importance of Transparency and Traceability within the Food Supply Chain

Traceability and transparency are becoming crucial in managing modern supply chains, assisting businesses in addressing rising customer concerns regarding food safety, responsible sourcing, and ecologically friendly practices. Duan et al. (2020) explain that the global food supply chain is a complex system of interrelated links that include farming, processing, distribution, and consumption. Each of these connections poses certain risks that require proactive management. Within this context, transparency refers to making supply chain operations visible and accessible to all stakeholders, whereas traceability allows stakeholders to trace product origin, history, and trajectory, which in turn empowers consumers to make informed decisions, elevating their trust in the integrity of the food supply chain (Ding et al., 2024).

When effectively employed, supply chain transparency initiatives provide significant internal and external benefits. According to Montecchi et al. (2021), transparency serves as a governance tool that reduces operational risks, promotes collaboration, and encourages accountability. Transparency and traceability assist players in the food supply chain to ensure compliance with food safety regulations, maintain product authenticity, and increase consumer trust by making process phases more visible to all stakeholders. This visibility additionally promotes trust in the ethical and sustainable practices followed across the supply chain, corresponding with growing Irish consumer demand for sustainable products. Almost 7 in 10 Irish consumers purchase sustainable products (Deloitte, 2023), and 70% are willing to pay a premium for them (PWC, 2023).

The globalisation of food supply chains has introduced higher risks of food fraud, contamination, misleading labelling, and unlawful practices that can have a negative impact on public health and consumer trust. For instance, major food scandals happen across the EU and Ireland, including the well-known horsemeat scandal in 2013, where products labelled as beef were found containing horsemeat instead (European Commission, 2023), or the salmonella in baby milk and eggs contaminated with fipronil insecticide (Jordan, 2017). Technologies like RFID and sensor networks have been used to reduce these risks, but Singh et al. (2022) claim that these old methods have struggled to keep up with the growing complexity of today's food supply chains, making them more vulnerable to fraud and inefficiency.

The rapid growth of worldwide trade often results in fragmented control, allowing products of doubtful quality to sneak through inspection gaps. In 2014, 28% of fish marketed in Ireland was mislabeled, while recently, the EU reported a high number of mislabeled products and olive oil fraud (Goodier, 2024). In 2024, Operation OPSON also resulted in the seizures of 22,000 tonnes of fraudulent food and drinks worth €91 million throughout Europe. The operation dismantled 11 criminal networks which involved counterfeit products and expired food reintroduced to the market with falsified labels (Henderson, 2024). Zhu et al. (2022) claim that strong and more modern traceability systems, such as blockchain technology, can help reduce these risks and ensure product quality by tracking its journey from farm to table, which is essential for ensuring the integrity of the food supply chain because they allow quick detection and resolution of safety issues. This is crucial in preventing large-scale recalls or contamination disasters, which may pose an irreversible health risk and weaken customer trust worldwide.

However, ensuring full transparency and traceability remains difficult. Budler et al. (2023) argue that complex global supply chains often include broken data systems, subcontracting, and multi-tiered networks, which further complicate full transparency and traceability. This fragmentation leaves holes in the network, which makes it difficult to find threats and hold people accountable. Chandan et al. (2023) also claim that stakeholders do not want to share data because they are worried about losing their competitive edge and securing their private information. Despite the apparent advantages, implementing stronger transparency and traceability measures might clash with business strategies that prioritise confidentiality and cost savings.

From this research perspective, transparency and traceability are crucial for fostering consumer trust in today's growing globalisation within the food supply chain. Past food scandals around the world, where mass recalls, adulterations, and mislabelling incidents have damaged consumer trust. These incidents have left consumers often questioning the quality of the food and doubting the information on the labels; thus, providing full transparency by offering the possibility to track each product from farm to table could help demonstrate that businesses are committed to full transparency, prioritising food quality, and fostering consumer trust. This also resonates with the increased consumer demand for ethical products, in which consumers seek reliable data on food origin, carbon footprints, animal welfare, and labour conditions (Jose et al., 2025).

Moreover, the demand for full transparency and traceability is expected to grow, driven in large part by an increasing amount of literature relating these strategies to increased customer trust, lower operational risks, and alignment with sustainability objectives. Transparency therefore acts not just as a defensive strategy against reputational damage but also as a proactive tool for gaining a competitive advantage in an ever-changing market and attracting socially and ecologically responsible consumers. Transparency, as shown by Montecchi et al. (2021), may serve as an effective governance instrument, encouraging responsibility at all stages of the supply chain. Companies that choose to not be transparent may find themselves at a competitive disadvantage in a market where reliable data about product origin is becoming more important. However, these aspirations are constrained, largely limited by organisational, cultural, and economic realities. As Budler et al. (2023) stated, food supply chain networks are fragmented, limiting the effective flow of information. Even the most powerful digital solutions may fail if corporate confidentiality and stakeholder conflict prevent data exchange. The underlying contradiction between corporate interests and public trust emphasises the need for balanced frameworks that safeguard important proprietary information while meeting consumers' entitlement to full transparency. In this context, digital technologies capable of ensuring transparency and real-time traceability are becoming essential. One promising innovation in this area is blockchain technology, which has emerged as a powerful tool for addressing many of the structural limitations currently facing food supply chains.

2.2 Blockchain Technology in Food Supply Chains: Opportunities and Challenges.

Blockchain technology has emerged as a disruptive tool for improving transparency, traceability, and security throughout the growing globalisation of the food supply chain. Its decentralised, tamper-proof ledger architecture protects data integrity and allows stakeholders to share product information in real time, lowering the risk of fraud and data manipulation, maintaining immutable records of product origin, transportation, and handling, and reducing environmental impact in the food supply chain, which is particularly important in meeting customer demand for ethical and sustainable sourcing (Chandan et al., 2023).

Blockchain, defined as a digital, decentralised, and distributed ledger, allows tamper-proof record-keeping via cryptographic validation, providing unprecedented transparency and traceability (Treiblmaier, 2018; Vern et al., 2024). Blockchain eliminates intermediaries, promoting greater interaction and collaboration, both of which are essential for reducing inefficiencies in traditional supply chains (Yontar, 2023). This technology offers several advantages to food supply chains, including the elimination of fraud, increased transparency, and improved operational efficiency by providing consumers with reliable, unchangeable information regarding the origin of food products.

As stated by Singh et al. (2022), the ability of blockchain to track products in real time is its core advantage in the food supply chain. This not only improves food safety but also allows quick responses to recall and contamination issues, reducing public health risks. Centobelli et al. (2022) further point out that integrating blockchain in the supply chain can synchronise information, which improves operational efficiency and lowers costs. This data synchronisation not only improves consistency, but it also reduces the fragmented structure of traditional systems, in which each stakeholder manages their own, sometimes contradictory, databases. Likewise, Castañeda & Feijoo (2023) emphasise blockchain's potential to transform supply chain procedures and consumer engagement strategies by providing accurate insights into product lifecycles. In an era where food safety and ethical sourcing are important, giving consumers direct access to verifiable information about product origin, production, and quality increases consumer trust and loyalty.

Carrefour, one of the largest retailers in the world, uses blockchain in its supermarkets around Europe that enables consumers to scan a QR code on chicken, milk, and veggies to see exactly where they came from and how they were produced (Carrefour, 2024). Nestlé has also been experimenting with blockchain since 2017 with the goal of letting customers track their food from farm to table (Nestlé, 2019).

Blockchain's immutable records also address common fears about fraudulent labelling or counterfeiting. It allows consumers to check whether products that are classified as organic or fair trade actually have such classifications. Singh and Sharma (2022) state that blockchain can validate claims of sustainability, leading consumers to trust more in these claims. Since more companies use words like "organic" or "locally sourced", this becomes more essential. Blockchain has the ability to allow retailers and producers to link these certifications or third-party audits to unalterable data. For example, IBM Food Trust allows businesses to add environmental or social certifications to a product's digital history, making claims about sustainability easier for customers to verify and which cannot be altered once input into the system (IBM, 2024).

Beyond increasing transparency, blockchain can improve operational efficiency, which is crucial for food supply chains that involve many countries and regulations. Real-time data sharing allows stakeholders to better coordinate inventory management, eliminate waste, and improve logistics scheduling. This shared information of product flows in real time reduces the challenge that occurs when different parties depend on separate systems or insufficient data. Such collaboration may speed up lead times and make administrative duties simpler, but it depends on all parties willingness to collaborate and keep accurate data (Yontar, 2023). Walmart's collaboration with the IBM Food Trust blockchain technology, for example, allows all parties involved see and change data in real time. This makes it easier for everyone in the supply chain to work together and coordinate the entire supply chain. Their blockchain system maintains track of more than 25 items from the farm to the store. This cuts the amount of time it usually takes to find out where they were produced from seven days to 2.2 days, which makes operations more efficient (Sristy, 2021).

The reality is that adopting blockchain in food supply chains requires a change in attitude among all stakeholders involved. Traditional supply chains often rely on power imbalances, in which bigger retailers or producers control the operations of smaller, more reliant partners. Blockchain, on the other hand, assumes democratised data exchange, needing more trust, cooperation, and reciprocity among all parties involved. However, blockchain's success is dependent, in large part, on parties being first convinced that the benefits of public visibility of their supply chain outweigh any concerns about revealing private information or losing their competitive edge.

Despite its apparent advantages, blockchain adoption is not without challenges. According to Tripathi et al. (2023), high costs, scalability difficulties, and regulatory uncertainty may limit its adoption. A lack of standardisation and skilled human resources further impact the adoption process. Setting up a sophisticated blockchain system, including related hardware, software, and skilled staff, may be expensive, particularly for small or medium-sized businesses that lack the financial resources of giant international firms. Costs such as cloud storage, integration with existing systems, training staff, and cybersecurity protocols may be difficult to justify for SMEs without immediate returns, risking creating a digital divide in the food industry between larger corporations who can capitalise on blockchain's benefits while smaller players may be excluded unless additional support is made available.

Cozzio et al. (2023) emphasise stakeholder resistance due to data-sharing concerns as well as challenging cooperation among all stakeholders. Companies are concerned that they may unintentionally breach antitrust rules or disclose proprietary information in a public ledger. This might raise questions regarding who can validate transactions, how disputes are managed, and whether external audits can be effectively integrated. The potential for reluctance extends to government institutions, which might doubt the reliability of a system outside of their direct control, or they may be sceptical about blockchain in the lack of explicit statutory regulations.

This research acknowledges blockchain's potential and challenges, emphasising why many scholars consider blockchain to be a revolutionary solution. However, it stresses the need for localised research. For instance, in smaller markets with distinct cultural norms, such as Ireland, blockchain's advantages and challenges may vary from global assumptions, influencing how blockchain's benefits are perceived by Irish consumers.

2.3 Consumer Sentiment and Blockchain Adoption in the Food Supply Chain.

According to Sharma et al. (2023), the broad adoption of emerging technologies such as blockchain in the food supply chain is heavily reliant on consumers perceptions, trust, and awareness, emphasising the need for consumer engagement early on. Previous research has shown that consumer trust is a broad and changing concept driven by perceptions of product quality, safety, and traceability, areas where transparent and immutable blockchain records can thrive (Meijer et al., 2020; Liu et al., 2023).

In food supply chains, providing accurate information about product origin, authenticity, and safety is critical for building trust. Blockchain's ability to provide end-to-end traceability and transparency is key in building that consumer trust. Treiblmaier and Garaus (2023) state that consumers trust more businesses that use blockchain technology more than those that use traditional traceability systems since blockchain provides more accurate and unalterable product information. This transparency allows consumers to monitor product sources and understand the processes involved, which improves their purchasing decisions. Likewise, Chen et al. (2021) claim that customers prefer blockchain-tracked products because they are more trustworthy and safer than traditional methods. This is because blockchain technology not only offers greater information than traditional traceability methods, but it also relies on distributed technology to ensure the authenticity and security of product information, allowing consumers to obtain more authentic product information. A recent study indicated that 63.7% of consumers actively seek and welcome information about where a product comes from when they are making buying decisions (McMullen, 2024).

In addition, Ayan et al. (2022) discuss further how blockchain may stop fraudulent products by making sure that labels are correct. This is especially helpful for those who want to buy high-quality and ethically made food. For instance, the Parmigiano Reggiano Consortium Cheese from Italy uses blockchain technology and edible microchips that are safe to eat to ensure their products are authentic and to protect them from being counterfeited (Stimolo, 2023).

Panghal et al. (2023) add that consumers are prepared to pay a premium for blockchain-tracked products, reinforcing their value in meeting consumer demands. Consumers believe that blockchain-enabled food systems provide greater objective, transparent, and trustworthy information, claiming that if quality assurance and full product information are offered, they will pay a higher premium to businesses that use blockchain-enabled food systems rather than traditional food systems. Cozzio et al. (2023) further argue that consumers are more likely to employ technology that provides exact supply chain information, as nowadays consumers are open to new technologies that provide extensive information about supply chain activities, emphasising blockchain's potential to increase consumer trust, thus influencing positive consumer attitudes and behaviours towards its farm-to-table traceability capability. Liu et al. (2023) add that blockchain, through end-to-end traceability information, creates relevant value for consumers due to its potential to reduce consumer concerns about the safety and quality of food products, increasing their trust in the whole agri-food sector.

This research agrees with the growing trend among scholars that claim a shift towards more data-driven, transparent interactions between consumers and food supply chain players, which in return can result in improved trust and engagement. According to Singh and Sharma (2022), the food industry is currently entering a new era, one dominated by consumers rather than industry leaders. Future food industry trends would be influenced by assurances of sustainability, well-being, and transparency. For example, an ADM study of customers throughout the world revealed that 73% of them felt better about companies that offer information about where and how their goods were produced or farmed (Vegconomist, 2023). Also, 93% of customers want food companies to be more transparent about what is in their food, where it comes from, and how it is produced (McMullen, 2024). The global wellness sector hit a record high of $6.3 trillion in 2023 and is expected to reach about $9.0 trillion by 2028 (Global Wellness Institute, 2024).

Despite these benefits, some concerns remain. Contini et al. (2023) state that many customers struggle to understand blockchain's mechanics, creating challenges to adoption. While Cozzio et al. (2023), Liu et al. (2023), and Singh et al. (2023) argue that some consumers are concerned about a lack of expertise, data security, technological complexity, and the perceived trustworthiness of the data provided, which serve as barriers to adoption. These challenges suggest that building confidence in blockchain among consumers requires unified governance that makes sure data is protected. To eliminate knowledge gaps, it is crucial to provide user-friendly platforms and straightforward communication. Blockchain can meet consumer needs for full transparency, but it needs strict data validation procedures like third-party certifications and standardised protocols to ensure consistent data input across all stakeholders. It also needs a joint effort to educate end users early on about how and why blockchain provides authenticity through its immutable and decentralised nature. It also stresses the importance of this study in finding out whether Irish consumers have similar challenges and how they see blockchain's potential in the Irish food supply chain.

2.4 The Irish Context: Cultural, Economic, and Geographic Considerations

The literature review demonstrates blockchain's innovative potential to improve transparency, traceability, and trust in food supply chains. However, most of the literature assumes a homogeneous consumer response to blockchain-based initiatives in food supply chains, often overlooking the significant cultural, economic, and geographical aspects that influence consumer attitudes. This study emphasises the need for localised studies, in agreement with Xing and Jin's (2023) argument that cultural, economic, and geographical factors influence customer attitudes and that it is necessary to understand the purchasing process or evaluation standards of consumers from different cultures.

Most studies tend to focus on bigger countries with larger populations, overlooking the specific needs of smaller countries such as Ireland, which has a population of about 5 million yet is considered a powerhouse in global agrifood exports. In 2023, Ireland exported €18 billion in agrifood products, while imports accounted for €13 billion, a 68% increase from 2014, from which almost 50% were beverages, dairy produce, and fruit/vegetables (IFAC, 2023). The growing number of exports and imports exposes Ireland to potential risks such as food fraud, contamination, and unethical sourcing, highlighting the potential need for a transparent and traceable food supply chain to maintain consumer trust both domestically and internationally. For instance, the Food Safety Authority of Ireland (FSAI) reported that in 2024 over 8,500 food-related complaints were recorded, many involving important items that failed to meet safety or labelling standards, along with multiple recalls due to the presence of foreign objects like glass, metal, plastic, and undeclared allergens (FSAI, 2024). Given Ireland's reputation as a premium food exporter, particularly dairy and beef, any erosion of consumer trust could have significant reputational and economic consequences. Strengthening the Irish food supply chain through modern technologies such as blockchain can serve not only as a safeguard but also as a competitive advantage in global markets.

However, Ireland's agri-food heritage may complicate this argument. Despite being a global export player, Ireland's agrifood sector is assumed to be close-knit, with high trust in local producers and a strong sense of community identity influencing consumer behaviour. Some consumers may consider blockchain unnecessary if they already feel local products and farms are trustworthy. Therefore, the potential for blockchain adoption in Ireland must be linked to local cultural norms, echoing Xing and Jin's (2023) argument for localised consumer research that considers consumers perspectives and cultural and socioeconomic differences.

Moreover, public health concerns further underscore blockchain's potential in Ireland. The overconsumption of ultra-processed foods (UPFs) accounts for one-third of Irish individuals daily calorie intake (O'Regan, 2024), and it is linked to health conditions such as type 2 diabetes and cardiovascular disease, in addition to increasing obesity rates that are expected to affect 88% of the population by 2060 (RTÉ, 2023). Blockchain's ability to provide transparency in food products and their nutritional content might encourage consumers to make healthier choices, reducing their reliance on UPFs and mitigating related health risks. If Irish consumers understand, via tamper-proof records, that a product meets high quality and nutritional criteria, they may be more likely to purchase it. Besides, there is a growing trend among Irish consumers, with 70% of them willing to pay more for sustainability and 50% willing to pay up to 10% more for ethically produced items (PWC, 2023). Based on the review of the literature, blockchain aligns well with these consumer demands by delivering reliable information on sourcing, manufacturing, and distribution. However, linking this desire with real buying behaviour requires a more in-depth examination of how Irish consumers perceive blockchain's potential for validating sustainability and ethical claims.

3. Research Question

The review of the literature provided a solid basis for understanding Blockchain's role in increasing transparency, sustainability, and ethical sourcing in food supply chains, which leads to the core of this research question:

"Can blockchain meet Irish consumers' increasing demands for food safety, sustainability, and ethical sourcing?"

To address this question, the research seeks to evaluate different Irish consumers perspectives towards blockchain, including awareness, willingness to adopt, and challenges.

3.1 Hypotheses

This research seeks to investigate the following hypotheses:

H1: Awareness and Perceived Benefits

- **H_0:** There is no significant relationship between Irish consumers' awareness of blockchain technology and their perception of its benefits for improving transparency in the food supply chain.
- **H_1:** Irish consumers who are more aware of blockchain are more likely to perceive it as a benefit for increasing transparency in the food supply chain.

H2: Willingness to pay more for sustainability/ethical sourcing

- **H_0: There** is no significant relationship between Irish consumers' valuation of sustainability/ethical sourcing and their willingness to pay a premium for blockchain-enabled food products.
- **H_1:** Consumers that value sustainability and ethical sourcing will be more prepared to pay a premium for blockchain-enabled food products.

H3: Barriers to Adoption

- **H_0:** Limited awareness and understanding of blockchain among Irish consumers do not pose significant barriers to its adoption in food supply chains.
- **H_1:** Limited awareness and understanding of blockchain among Irish consumers pose significant barriers to its adoption in food supply chains.

<u>H4: Local Culture</u>

- **H$_0$: Irish** consumers do not perceive greater need for blockchain verification in imported products than in products produced locally.
- **H$_1$:** Irish consumers perceive a greater need for blockchain verification in imported products than in products produced locally.

Overall, this research aims to investigate Irish consumers' perceptions, awareness, and willingness to adopt blockchain technology in food supply chains, considering Ireland's unique cultural environment, which has not been examined before. It seeks to assess whether Irish consumers, who have historically relied on their heritage reputation and often place high trust in local agrifood producers, share the same concerns about product origin and are welcoming blockchain's potential. In addition, the public health concerns, the growing number of imports and exports, and Irish consumers' increasing willingness to pay extra for sustainable and ethically produced products may increase blockchain adoption in Ireland. The findings may not only answer the research question but also determine whether concerns associated with cost sensibility reduce consumers' perceived need for blockchain technology or provide insights about how blockchain can thrive in Ireland's food supply chain. In doing so, it also hopes to make a significant contribution to the larger discussion about blockchain use in food supply chains, help governments and businesses create tailored strategies, and make informed decisions on blockchain adoption, particularly in the Irish context.

4. Methodology

4.1 Philosophical Assumption

This study adopts an ontological position based on the critical realism paradigm, which maintains that an objective reality exists independent of human perceptions while acknowledging that our interpretation of this reality is influenced by social, cultural, and economic factors. Critical realism provides a systematic approach that recognises both observable consumer attitudes and the underlying, often unseen, factors that drive them, which exist objectively and can be examined quantitatively. This research builds on these values by investigating how Irish consumers perceive blockchain. It assumes that consumer attitudes, such as awareness, perceptions, and willingness to adopt blockchain technology in Ireland's food supply chain, are quantifiable things that exist "out there" and can be captured through empirical research (Bhaskar, 2008).

As mentioned in the review of the literature, this research believes that cultural, economic, and geographical factors are likely to influence consumer sentiment toward blockchain potential in line with Xing and Jin's (2023) argument. For instance, in Ireland, the local agrifood industry is usually connected to national identity, heritage, and community trust, which may influence the perceived necessity of blockchain adoption in the Irish food supply chain. Irish consumers tend to associate local food with higher quality, authenticity and support for community (Bord Bia, 2017; KPMG, 2022).

Ireland's robust agrifood industry and high customer confidence in local food products may affect consumer attitudes that vary from worldwide views of blockchain trends. While blockchain is often positioned as a global solution to large-scale food fraud, inefficiencies, and quality assurance challenges (Singh **et al., 2022**), its perceived value from the Irish consumers perspective is unclear. Failure to account for these cultural factors risks losing out on necessary behavioural trends that influence the acceptance of blockchain, perhaps leading to inaccurate implementation strategies that do not align with Irish consumer preferences.

Given the ontological position, a deductive, quantitative and descriptive research methodology will be followed. This method is better suited for the research objectives since it enables statistical analysis based on a hypothesis-driven approach that helps for a systematic analysis of patterns and correlations in a large, representative sample, ensuring that the results are based on objective, measurable data rather than subjective interpretation (Creswell and Creswell, 2017). Although the study seeks objectivity, it recognises the possibility of researcher bias, especially in emphasising localised cultural influences (Xing and Jin, 2023). However, by relying on quantifiable data to guide interpretation, this will mitigate bias and enhance validity, ensuring that findings emerge from the data itself rather than from the researcher's preconceptions.

While deductive in nature, this study also adopts a descriptive research design, aiming to analyse consumer attitudes within a specific context, specifically, Irish consumers' perspectives on blockchain technology. This approach helps describe and understand a specific phenomenon by capturing consumer perspectives about blockchain at a given time and guarantees that data is collected in an organised and empirical manner, strengthening methodological validity, and helps analyse the research hypotheses. Given the potential influence of Ireland's distinct cultural factors, this method provides a structured way to investigate how these factors may influence consumer views about blockchain (Creswell and Creswell, 2017).

4.2 Research and Survey Design

This research employs a deductive, descriptive, and quantitative design approach. The deductive logic derives from the hypothesis-testing nature of this research, aiming to test specific assumptions regarding consumer awareness, perceived benefits, willingness to adopt, and main concerns about blockchain adoption in the Irish food supply chain at a single point in time.

The primary data collection was a structured online survey created via Microsoft Word. Surveys allow for findings to be methodical and quantitative, thus enabling strong analysis of elements impacting consumer perspectives on blockchain within the Irish context within the available timeframe. Using surveys is a deliberate attempt to provide empirical, statistically relevant information reflecting national consumer sentiment at scale that would allow testing the proposed hypothesis. Although surveys do not provide for in-depth, interpretive research of individual views, they offer a large-scale, representative dataset that could reveal important trends and correlations (Creswell and Creswell, 2017).

The survey starts with an introductory blurb, briefly explaining the research aims and ethical guidelines, asking for participants consent, and the estimated time to complete. It is composed of 20 required, close-ended questions, each designed with 5-point Likert scales, with some ranging from "Strongly Agree" to "Strongly Disagree", "Extremely Important" to "Not Important", or "Daily" to "Monthly", to collect data regarding consumers' attitudes, perceptions, and behavioural intentions that could be analysed statistically and help to test the predefined hypotheses. The choice of Likert scales allowed for greater correlation testing, making it methodologically appropriate to test the hypothesis.

The survey was made public on the 10th of March 2025 and closed after five weeks. It was distributed through online platforms such as Facebook, Instagram, and LinkedIn. These social media platforms were selected due to their popularity among Irish consumers and ability to maximise reach and participation of a wide range of Irish consumers within the given timeframe.

4.3 Research Themes

 The research focuses on four themes based on the research hypothesis and were selected to evaluate Irish consumers sentiment towards transparency, ethical priorities, adoption intention, and potential cultural influences relevant to the research question. It also includes demographic and behavioural indicators such as age, grocery purchasing decision-maker, priority when buying food, how important local food is and standard body label certifications like Bord Bia, aimed at drawing more of the participants opinions.

The first theme is related to the first hypothesis about consumers awareness and perceived benefits of blockchain. The questions evaluate consumers familiarity and opinions related to blockchain's potential in improving transparency, traceability, and verified ethical and sustainability claims. This is particularly important because if Irish consumers are unaware or do not understand blockchain, they are unlikely to perceive it as useful in the Irish food supply chains. This could also be important for businesses who are thinking about implementing blockchain in the Irish food supply chain, providing them with useful insights into how to better tailor strategies for those consumers who are less aware of blockchain's capabilities.

The second theme focuses on hypothesis two about blockchain's potential to increase consumers' trust in ethical and sustainability claims of food brands and their willingness to pay a premium for these products if blockchain guarantees its ethical sourcing. This theme aligns with the research question by evaluating whether blockchain can add value to Irish consumers and if they are willing to pay more if blockchain guarantees that products are sourced ethically. This is particularly important in the context of sustainability, which is a growing trend among Irish people, as reported by PWC's survey mentioned in the literature review.

The third theme explores hypothesis three, aiming to discover Irish consumers concerns and potential barriers that may impede blockchain adoption in the Irish food supply chain and if they consider that greater education about blockchain would be necessary to increase their trust in it. This theme not only adds value to the research question but also contributes to the wider academic debate on blockchain's challenges in the food supply chains. It evaluates whether Irish consumers concerns or barriers to adoption align with scholars' arguments outlined in the review of the literature, such as technological complexity, lack of awareness, and cost. Lastly, the fourth theme focuses on cultural nuances linked to hypothesis four, which explores whether strong cultural trust in Irish-made products could act as a barrier to blockchain's adoption, suppressing the perceived need for it, and whether their perceptions differ between imported and domestic food products.

4.4 Sampling

Focussing on more than one demographic group is important from an ontological standpoint since participants' answers are based on their views of the world and the things they believe exist beyond it and how these things influence them. Therefore, the research sampling approach is a probability sampling technique that allows for different demographic groups within Ireland's consumer base to be represented, ensuring a varied sample of respondents depending on elements such as age, gender, purchasing habits, and awareness of blockchain technology, thus enhancing the generalisability of results. This ensures that the findings are not inclined towards a particular consumer base but rather provide a bigger view of blockchain adoption potential in Ireland, minimise any sample bias towards a specific target, and help the findings reflect diverse consumer perspectives (Ahmed, 2024). The aim was at least 150 responses to ensure sufficient statistical data for a greater analysis; however, the research secured 110 valid responses due to the limited data collection period. While not ideal, the sample size remains useful for exploring correlation analysis for the intended purpose of this research.

4.5 Pilot

Before making public the survey, a pilot of twenty-one participants was conducted to assess the survey's clarity, reliability, and validity. This allowed for changing survey questions where necessary, ensuring a clear and effective gathering of the research objectives. To analyse internal consistency, the data collected was examined using Cronbach's alpha and had a result of 0.6, which is an acceptable score for an exploratory study (Kline, 1999). Any identified discrepancies or inconsistencies during the pilot were fixed before broad distribution.

4.6 Data Analysis

Microsoft Forms automatically provides an Excel file for the researcher to download once the survey is closed that allows for further testing. After an initial screening to remove any incomplete responses to ensure that the final analysis consists only of fully completed responses that preserve data integrity, the responses were analysed using Microsoft Excel, and the tests employed formulas, which reduces mistakes and converts data into several variables for analysis to help identify trends, patterns, and correlations that ultimately contribute to the goal of this research of understanding Irish customers' attitudes (Rahman and Muktadir, 2021).

Descriptive statistics will be used to analyse the findings in order to provide a general picture of the sample population, including demographic (e.g., age, food-buying roles, sustainability priorities) and behavioural indicators (e.g., how frequently participants check food labels or prioritise local food sourcing). Inferential tests such as Spearman's Rank Correlation Coefficient would be employed to test hypotheses one and two. This test is appropriate due to the ordinal nature of Likert-style responses and the non-parametric distribution of the data. The second test will be the Chi-Square Test of Independence to identify whether groups in one variable correspond significantly with categories in another (Fávero and Belfiore, 2019).

In addition, a Cronbach's Alpha test will be performed to ensure internal consistency and validity, aiming for a coefficient of 0.6 or above that will be regarded as satisfactory in order to strengthen trust in the validity of the constructs measured (Kline, 1999). Data will be visually presented using pie charts where relevant to allow for easier interpretation of key findings (Fávero and Belfiore, 2019). Overall, this approach allows for the testing of the hypothesis presented while describing the current environment of consumer sentiment about blockchain. The results are meant to provide insightful, evidence-based analysis for both industry players and policymakers interested in understanding consumer perspectives and regional behavioural dynamics around blockchain potential in Ireland's food supply chain.

4.7 Ethics

The researcher followed the ethics policies and procedures of the National College of Ireland in conducting this research investigation and in line with General Data Protection Regulation (GDPR) requirements.

Participants were provided with a study introduction blurb outlining the objectives of the research and how their responses would contribute to business research, their rights, and how their data would be used. To ensure ethical compliance, participants were required to give their consent before starting the survey, reinforcing that participation is voluntary and that they could stop answering at any time without any obligation to continue. Only individuals aged 18 and over were eligible to complete the survey, a condition that was explicitly stated before participation began and where participants had to confirm. Participants were also advised that if they required any additional information, they could contact the researcher via email for further clarification.

To comply with GDPR data protection and privacy rules, participants anonymity will be preserved throughout the process. Data will be securely saved and only accessed via a password known only by the researcher and will be deleted accordingly. Only completed responses will be included to ensure that the data is accurate and reliable. Throughout the research process, the highest ethical standards will be followed to guarantee transparency and ethical integrity.

4.8 Limitations

The research aims to provide insightful analysis on blockchain potential in Ireland's food chain based on consumer perspectives; however, there are certain limitations that must be acknowledged. The response rate determines the degree of sample representation, so even with the best attempts to raise participation, it might affect the generalisability of the results. The dependency on self-reported survey responses can result in various biases in which individuals respond in a way they see as favourable rather than completely honest. Also, surveys represent consumer attitudes at a certain moment in time and may not entirely reflect the underlying contextual motivations impacting their views, limiting the account for any variations in awareness and perspectives over time.

Further, the research has a restricted timeline since it needed to be finished by the fourth of July 2025 for academic grading purposes, reducing the quantity of data that could be gathered and processed. Due to this time limit, the survey included a maximum of 20 questions, reducing the possibility of creating further correlations that may influence consumer sentiments towards blockchain, and a longer time frame would allow for a bigger sample size and more in-depth analysis.

5. Data Analysis and Findings

This section presents the analysis and findings from the survey conducted to examine Irish consumers' attitudes towards blockchain in the food supply chain. The questionnaire was structured around four hypotheses, each exploring a specific theme of consumer awareness, behaviour, or expectation related to blockchain use in food supply chain transparency, traceability, ethical sourcing, and sustainability. 110 responses were collected given the time limit the research had. The demographic profile of the sample shows that the most represented age group was 35-44 (41%), followed by 25-34 (25%) and 45-54 (17%).

2. **Age**

● 18–24	12
● 25–34	28
● 35–44	45
● 45–54	19
● 55+	6

In addition, 93% of respondents were actively involved in grocery decisions, with 55% sharing decisions equally, 38% making them entirely, and only 4% providing input or making occasional grocery purchases. When asked about their purchasing behaviour, 47% of respondents stated weekly, 41% 2-3 times per month, 8% multiple times per week, and only 4% daily.

3. **Are you the primary or joint decision-maker for grocery and food purchases in your household?**

● Yes, I make all of the grocery and food purchase decisions	42
● Yes, I share decision-making equally with someone else	61
● No, but I provide input on what is purchased	3
● No, but I make occasional grocery purchases	4
● No, I am not involved in grocery or food purchases at all	0
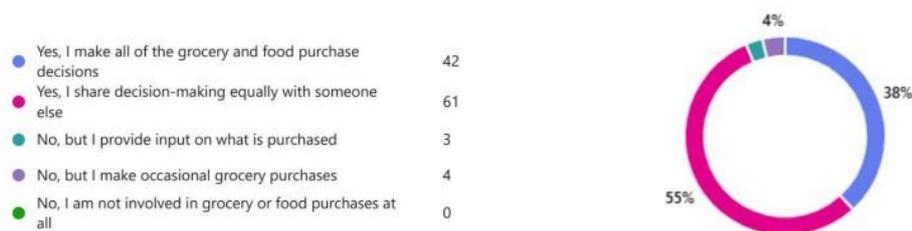
When asked about their top priority when buying food, 35% of respondents chose "nutritional value", 28% "price", 27% "brand reputation and trust", and only 8% chose "sustainability and ethical sourcing" as their top priority.

5.1 Awareness and perceived benefits

The objective for hypothesis one was to determine whether greater consumer awareness of blockchain relates to perceiving it as useful for improving transparency within the food supply chain.

- **H_0:** There is no significant relationship between Irish consumers' awareness of blockchain technology and their perception of its benefits for improving transparency in the food supply chain.

- **H_1:** Irish consumers who are more aware of blockchain are more likely to perceive it as a benefit for increasing transparency in the food supply chain.

To test the relationship between these variables, a Spearman's rank correlation test was used, as it was deemed appropriate for analysing relationships between two ordinal variables. The two variables were coded using a clear ordinal scale. Question 9, *"How familiar are you with blockchain technology?"* was ranked 1 for "Never heard of it" to 5 for "Very familiar", while question 12, *"Blockchain can improve transparency in food sourcing. How useful do you think this is?"* was ranked 1 for "I do not understand blockchain" to 5 for "Extremely useful". The Spearman's rank correlation revealed a coefficient of $\rho = 0.4088$, $n = 110$, $t = 6.655$, $df = 108$, $p < 0.00001$. This result indicates a moderate positive relationship between the two variables, meaning that consumers with greater familiarity with blockchain tend to perceive it as more useful for improving transparency in the food supply chain. Therefore, the null hypothesis is rejected.

These results align with Ding et al.'s (2024) findings that increased familiarity is associated with consumers' perceived value of blockchain's transparency-enabled benefit, revealing that blockchain's enabled transparency enhances consumers' trust in the integrity of the food supply chain, allowing them to make informed decisions. Also aligns with Castañeda & Feijoo's (2023) claim of blockchain's potential to enhance consumer engagement through access to verifiable product lifecycle data.

In question 9, 59% of respondents had a basic, moderate or high familiarity with blockchain technology, and 19% had never heard of it, while 22% of respondents had heard of it but did not understand it. Despite this, in question 12, 79% of respondents considered blockchain to be "extremely useful" for improving transparency in the food supply chain, showing great interest in its potential even for those who do not fully understand it, but they indicated openness to it if blockchain offers improved transparency. This gap indicates an opportunity for targeted education strategies, as Montecchi et al. (2021) suggested that clear communication strategies about blockchain's role are essential to consumer engagement and acceptance.

In addition, the other questions related to the theme linked with hypothesis one provided further insights. In question 10 respondents were asked, "Have you encountered blockchain in the context of food supply chains?" 47% stated, "no, never"; 27% chose, "not personally, but I know about it"; and 21% were "unsure", suggesting a high level of unfamiliarity with blockchain application in the food industry despite many well-known businesses using it. In question 11, *"Blockchain can track a food product's journey from farm to store. How useful do you think this is?"* 77% of respondents considered this as "extremely useful". This again suggests that even without a high level of encounter with the technology in food supply chains, consumers do appreciate blockchain's potential related to themes they care about, as seen in the literature review.

5.2 Willingness to pay more for sustainability and ethical sourcing

The objective for hypothesis two was to analyse whether consumers believe blockchain could increase their trust in ethical and sustainability claims of food brands and their willingness to pay more for products if blockchain guaranteed its ethical sourcing.

- **H_0:** There is no significant relationship between Irish consumers' valuation of sustainability/ethical sourcing and their willingness to pay a premium for blockchain-enabled food products.
- **H_1:** Consumers that value sustainability and ethical sourcing will be more prepared to pay a premium for blockchain-enabled food products.

To test this hypothesis, the Spearman's rank correlation test was applied again, appropriate for analysing the relationship between ordinal variables without assuming normal distribution. The results revealed a strong positive correlation of $\rho = 0.534$, $n = 110$, $t = 6.564$, $df = 108$, $p < 0.00001$, rejecting the null hypothesis and confirming that consumers who value sustainability and ethical sourcing are more likely to pay a premium for food products if blockchain guarantees its ethical sourcing.

Question 13: *"Would blockchain increase your trust in the ethical and sustainability claims of food brands?"* revealed that 55% of respondents believed that blockchain could increase their trust in food brands' claims related to sustainability and ethical claims, while in question 14, "Would you pay more for a food product if blockchain guaranteed its ethical sourcing?", 45% of respondents answered that they will pay a premium depending on the product, 15% only 5% more, and 10% between 6 and 10% more. However, 29% stated that they would not pay extra. This is significant, as it may be shaped by Ireland's current economic climate. Recent research showed that half of Irish adults have reduced spending in response to the rising living costs exceeding European averages (Finlay, 2025).

Question 16 focused on respondents' preference to pay a premium for food types, from which 59% indicated they will pay a premium for ethical and sustainably sourced meat and seafood, followed by 25% for fresh produce such as fruits and vegetables, and 13% for dairy products. However, despite strong willingness to pay more for sustainability and ethical sourcing, question 15 revealed that transparency and traceability were the leading factor for justifying paying a premium for it (45%), followed by verified ingredient origin and quality (23%), verified ethical sourcing and sustainability claims (13%), and improved food safety (10%).

These results indicate that despite consumers appreciating sustainable and ethical sourcing, transparency, traceability and food origins carry more weight at the point of purchase, aligning with Montecchi et al. (2021), who claim that transparency is no longer a goal but a strategic asset for businesses. While Treiblmaier (2018) and Chandan et al. (2023) stress that bridging the gap between customer intent and real behaviour depends on third-party certification, clear communication strategy and data easily accessible. Consumer confidence can be enhanced by blockchain's capacity to provide data accessible to them. Blockchain has the potential to fulfil consumers' concerns within the food supply chain, offering full transparency, traceability, and verified claims of sustainability and ethical sourcing, which in turn can shape market behaviour and increase consumers' trust and engagement.

5.3 Barriers to adoption

Hypothesis three's objective was to analyse whether a high or low level of blockchain awareness and understanding is influenced by consumers' perceived obstacles to adopting it.

- **H_0:** Limited awareness and understanding of blockchain among Irish consumers do not pose significant barriers to its adoption in food supply chains.
- **H_1:** Limited awareness and understanding of blockchain among Irish consumers pose significant barriers to its adoption in food supply chains.

A Chi-square test was conducted using the survey's question 9 (familiarity with blockchain) and question 17 (biggest barrier to adoption). This test asset whether there is a statistically significant relationship between the level of familiarity and primary barrier to adoption, and then calculated the observed and expected frequencies for each combination.

The result of the chi-square yielded χ^2 (16) = 0.96008, p = .999. Because the p value is > 0.05, there is no significant relationship between consumers' level of blockchain familiarity and the barriers they indicated. Meaning that those with greater familiarity were no more or less likely to choose a particular barrier than those with little or no awareness. Therefore, we fail to reject the null hypothesis. These results are relevant, as they challenge the assumption that a high-level familiarity with blockchain potential is enough to trust it. Instead, it suggests that other factors, like cost sensitivity or preference for traditional labels, are still embedded in consumers attitudes.

While the chi-test revealed no significant relationship, the qualitative responses from question 17 provided valuable qualitative insights into consumer sentiment. 33% of respondents chose "cost concerns", followed by 25% "preference for traditional labels", 22% "lack of awareness", 15% "uncertainty about blockchain's real benefits in the food supply chain", and 5% "distrust in the technology". These findings align with the review of the literature as stated by Tripathi et al. (2023) and Cozzio et al. (2023), who claimed that cost and technological complexity are key barriers to adoption, while Contini et al. (2023) stated that limited understanding of blockchain remains a key challenge to its adoption.

Further, question 18 explored consumers' main concerns about blockchain in the food systems, from which 29% chose "data privacy risks", 25% increased food prices, and 21% "reliability and accuracy of blockchain data". However, when asked in question 19 if better education about blockchain would increase their trust in it, 47% chose "Yes, definitely" or "Yes, somehow", and 49% selected "Maybe", suggesting a potential opportunity to alleviate their concerns and barriers if they are provided with clear communication, targeted informational campaigns, and education about blockchain's benefits. As Singh et al. (2023) claimed, technological complexity could deter consumer trust in digital systems like blockchain, highlighting the need for user-friendly implementation systems that would help consumers interact with it and not see it as a complex system.

5.4 Local Culture

The hypothesis four objective was to examine whether Irish consumers' local farming tradition and perceived quality of local food products perceive a greater need for blockchain verification in imported products than domestic ones.

- **H_0:** Irish consumers do not perceive greater need for blockchain verification in imported products than in products produced locally.
- **H_1:** Irish consumers perceive a greater need for blockchain verification in imported products than in products produced locally.

To test this hypothesis, a chi-square test of independence was conducted using question 20: "Do you believe Ireland's strong local farming traditions and perceived quality of local food reduce the necessity for blockchain traceability in domestic food supply chains?" and question 21, "Which statement best reflects your view on blockchain verification for domestic vs. imported products?" A contingency table was created, and responses in Q20 were grouped as follows: "Strongly agree", "Agree" "Strongly disagree", and "Disagree" were merged, and "Maybe" was treated as a separate category. In question 21, the categories "It is not necessary for either" and "Unsure" were excluded due to 0 responses.

The chi-test yield χ^2 (4) = 0.09, p = .999, indicating that there is no significant relationship between consumers' cultural trust in Irish food and their perspective on greater verification need for imported products than domestic ones, indicating that consumers believe blockchain's potential to provide transparency and traceability is equally important for imported and domestic products. Therefore, we fail to reject the null hypothesis.

Question 20 revealed that 61% of respondents either strongly disagreed or disagreed that the perceived quality of food of domestic products does not need blockchain's enabled traceability capability, while only 21% agreed or strongly agreed with this statement. Similarly, in question 21, 64% of respondents believe that blockchain-enabled transparency is equally important for both imported and domestic food products, while only 28% believe it is more important for imported than domestic ones.

These insights further support the null hypothesis, indicating that Irish consumers seem to support blockchain-enabled transparency and traceability in the food supply chain regardless of food origins and challenge the assumption that Irish consumers inherently trust local products more and view blockchain as unnecessary for domestic products. The findings challenge one of the research's assumptions that Irish people trust in local food would perceive blockchain as unnecessary in the Irish food supply chain. Instead, it indicates that even though they feel proud of the "Made in Ireland" stamp, they still want greater transparency that goes beyond national pride. This could have been affected by recent food safety incidents, such as mislabelled olive oil (Goodier, 2024), and the OPSON operation that exposed widespread food fraud across Europe (Henderson, 2024), which may have contributed to increased awareness of potential food supply chain vulnerabilities for both domestic and imported food products alike.

These results are further supported by findings from the Food Safety Authority of Ireland (FSAI, 2024), which recorded over 8,500 food-related complaints and multiple recalls involving foreign objects, weakening the assumption that local food automatically means safe, which may increase openness to blockchain-enabled transparency and traceability from farm to table for food products, as Jose et al. (2025) and Ayan et al. (2022) stated that blockchain is particularly beneficial in verifying food origin and deterring fraud, which is not exclusive to imports, and even in countries with high local food trust, blockchain's immutable nature offers enhanced assurance.

6. Discussion and Conclusion

This research offers valuable insights into the relationship between Irish consumer opinions and blockchain potential in the Irish food supply chain. Each hypothesis focused on key themes that were analysed against relevant parts of the existing literature, illustrating a nuanced understanding. H1 and H2 rejected the null hypothesis by employing Spearman's rank correlation test, while H3 and H4 were tested using the chi-squared test, which fails to reject the null hypothesis.

The first hypothesis resulted in a significant positive relationship between blockchain awareness and perceived transparency usefulness, supporting Ding et al.'s (2024) claim that transparency in the food supply chain helps consumers build confidence in them and make informed decisions. This is further supported by Treiblmaier and Garaus's (2023) claim that consumers are more open and likely to trust businesses that adopt technologies like blockchain that could offer full transparency and accurate data easily accessible by consumers. Moreover, Sharma et al. (2023) claim that awareness and trust in the adoption of emerging technologies like blockchain rely heavily on consumer perception, emphasising the need for targeted consumer engagement and information on its transparency benefits early on for its successful integration. H1 shows that even Irish consumers with moderate or basic awareness of blockchain perceive it as useful in enhancing transparency in the food supply chain, providing valuable insights on their openness to integrate it in the Irish food supply chain, and echoing the growing global trend of consumers feeling more positively about companies that are transparent about how and where food products were grown, as reported by ADM's global consumer research. Additionally, McMullen (2024) reported that 93% of consumers want transparency, but what they need is straightforwardness and simplicity. Thus, achieving successful blockchain adoption will demand user-friendly interfaces alongside targeted communications that elevate consumer trust.

Despite an almost 60% awareness of blockchain technology, the second hypothesis revealed a positive relationship between the two variables that rejected the null hypothesis. These findings align with Singh and Sharma's (2022) claim of blockchain's role in validating and verifying sustainability claims and minimising greenwashing. Likewise, with Panghal et al. (2023), research found consumers' willingness to pay a premium for transparency and ethical verification of food origins when they are clearly provided. In the Irish context, these results are supported by a PWC (2023) survey, which reported that 70% of Irish are willing to pay a premium for sustainability products. Despite these results, H2 discovered a more complex relationship between sustainability values and willingness to pay a premium for food products if blockchain validates these claims. 29% of respondents indicated that they will not do it, aligning with Panghal et al. (2023), who stated that even though some consumers value verified sustainability claims, cost concerns often control their willingness to pay. The results also indicate that greater consumer education and awareness initiatives about blockchain potential, particularly its enabled transparency, may drive its adoption in the food supply chain. As Treiblmaier (2018) stresses the importance of clear communication and education strategies in translating consumers values into purchase behaviour, which are also crucial to build trust and engagement.

The third hypothesis analysed if the broader assumption that limited blockchain awareness may be the main reason as an obstacle for its adoption. The results showed that there was no significant relationship between the two variables, failing to reject the null hypothesis. Nonetheless, some of the qualitative responses from the theme pointed towards some of the gaps that still exist, such as scepticism around data accuracy, vague value propositions, and unfamiliarity with the benefits of blockchain in the food supply chains. These findings are consistent with Contini et al. (2023), where respondents highlighted the difficulty of understanding the technical components of blockchain, which ultimately leads to distrust. Similarly, the studies of Cozzio et al. (2023), Liu et al. (2023), and Singh et al. (2023) discussed consumer fears, suggesting that trust, particularly for consumers, does not stem from simply providing data but rather how that data is presented, corroborated, and collected for the end-user. The absence of straightforward, easy-to-understand, and actionable information may prevent consumers from associating blockchain with greater transparency in the food supply chains.

Further, hypothesis four focused on the cultural influences and perceived need for blockchain in imported versus domestic food products. Surprisingly, there was not a significant relationship between those two variables, failing to reject the null hypothesis, challenging the assumption in the literature that a high level of cultural trust in local food reduces the perceived need for greater technological systems like blockchain. These results reaffirm Xing and Jin's (2023) argument that consumer attitudes are shaped by cultural, geographic, and economic dynamics, highlighting the need for localised research to better understand consumers views.

In addition, within the Irish context the results revealed that Irish consumers are aware of food risks and food supply chain vulnerabilities, which could be due to the growing number of imports and exports that Ireland is experiencing. Likewise, as reported by FSAI (2024), there has been an increase in food complaints and food product recalls. The results may have also been influenced by recent food scandals, as mentioned above, which seemed to have eroded trust in the food supply chain regardless of origins. These consumer views also align with Jose et al. (2025) and Ayan et al. (2022), who claim that there is a growing global risk due to the complexity of the modern supply chains, and consumers increasingly demand greater transparent verification systems across all food supply chains for their assurance. Thus, assumptions of the influence of cultural trust in the local food may no longer hold true in an era where globalisation is every day more noticeable. Ultimately, these results indicate the increased Irish consumers openness to greater digital systems like blockchain, which is perceived as a tool with the potential to strengthen trust, transparency, and the integrity of the food supply chain.

Overall, the findings of this study answered positively the research question. Based on the analysis, survey responses, and the hypothesis results, it suggests that Irish consumers do believe blockchain could meet their demands, increasing transparency, food quality, and verified sustainability and ethical sourcing. Despite this, there are concerns and barriers, like the cost and complexity of the technology, that must be addressed first. Its success lies in how well its benefits are communicated and adapted to local realities. This research contributes to the broader academic field by offering localised insights about Irish consumers attitudes towards blockchain potential in the food supply chain.

6.1 Conclusion

To finalise, this research aimed to explore whether blockchain can meet Irish consumers' increasing demands for quality, sustainability, and ethical sourcing, which were structured around four hypotheses aimed at testing relevant themes within the topic. The findings from H1 and H2 rejected the null hypothesis and revealed a positive relationship between the variable tested, aligning with relevant research from the literature review. Many consumers with basic or moderate awareness perceive blockchain as useful for increasing transparency in the food supply chain, aligning with the broader literature.

However, while many consumers were willing to pay a premium if blockchain guaranteed sustainability and ethical sourcing, many others chose price increases as a main concern, indicating that while some would pay a premium for those products, cost concerns remain a clear barrier to blockchain adoption among the majority. In addition, label preferences and the complexity of the technology were among the main concerns about blockchain implementation in the food supply chain, highlighting the need for greater consumer education and targeted campaigns about blockchain's potential for increasing consumer trust.

The findings also indicate that cultural assumptions are no longer enough to meet consumer trust. Even in countries like Ireland, where traditional farming is part of the country's heritage and consumers were assumed by the researcher to have a high level of trust in the locally produced food, instead they are increasingly demanding greater transparency of food products regardless of the origins and are no longer satisfied with reputational trust alone. Ultimately, these findings answered the research question positively, offering valuable insights into blockchain's potential to meet evolving Irish consumer needs, but it must be paired with targeted communication and addressing first consumers main concerns and barriers to its adoption.

6.2 Limitations and Future Research

This research was not without limitations. First, the sample size of 110 was small due to the limited time available to test the results and finalise the research. A larger sample could have yielded greater analysis and generalisation. The survey had 20 questions, which limited the ability to explore other possible correlations between more diverse variables. The data was self-reported through an online survey, which risks response bias. Participants could have interpreted questions differently or responded based on their perceptions at that moment, rather than their long-term attitudes. Given these limitations, further research could adopt a mixed approach, including quantitative and qualitative methods. There is an opportunity to increase the sample size to capture more demographics and consumers attitudes, which could result in greater analysis of a wide range of diverse variables. Future studies may employ a cross-functional approach to also include qualitative results, explore cross-cultural comparisons and investigate how attitudes towards blockchain use in the food supply chain evolve over time.

7. Bibliography

Ahmed, S.K. (2024). *Research methodology simplified: How to choose the right sampling technique and determine the appropriate sample size for research.* Oral Oncology Reports, 12 (100662), pp.100662–100662. Doi: https://doi.org/10.1016/j.oor.2024.100662.

Ayan, B., Güner, E. and Turan, S.S. (2022). *Blockchain Technology and Sustainability in Supply Chains and a Closer Look at Different Industries: A Mixed Method Approach.* Logistics, 6(4), p.85. doi: https://doi.org/10.3390/logistics6040085.

Bhaskar, R. (2008). *A Realist Theory of Science.* Available at: https://uberty.org/wp-content/uploads/2015/09/Roy_Bhaskar_A_Realist_Theory_of_Science.pdf [Accessed 9 Dec. 2024].

Bord Bia (2017). *Two thirds of Irish consumers believe it is 'important to buy local food'.* Available at: https://www.bordbia.ie/industry/news/press-releases/two-thirds-of-irish-consumers-believe-it-is-important-to-buy-local-food/ [Accessed 10 Mar. 2025].

Budler, M., Quiroga, B.F. and Trkman, P. (2023). *A review of supply chain transparency research: Antecedents, technologies, types, and outcomes.* Journal of Business Logistics, 45(1). doi: https://doi.org/10.1111/jbl.12368.

Carrefour (2024). *Food blockchain | Carrefour Group.* Available at: https://www.carrefour.com/en/group/food-transition/food-blockchain [Accessed 4 Mar. 2025].

Centobelli, P., Cerchione, R., Vecchio, P.D., Oropallo, E. and Secundo, G. (2022). *Blockchain technology for bridging trust, traceability and transparency in circular supply chain. Information & Management*, 59(7), p.103508. Available at: https://www.sciencedirect.com/science/article/pii/S0378720621000823 [Accessed 19 Nov. 2024].

Chandan, A., John, M. and Potdar, V. (2023). *Achieving UN SDGs in Food Supply Chain Using Blockchain Technology. Sustainability*, 15(3), p.2109. doi: https://doi.org/10.3390/su15032109.

Chen, X., Shang, J., Zada, M., Zada, S., Ji, X., Han, H., Ariza-Montes, A. and Ramírez-Sobrino, J. (2021). *Health Is Wealth: Study on Consumer Preferences and the Willingness to Pay for Ecological Agricultural Product Traceability Technology: Evidence from Jiangxi Province China.* International Journal of Environmental Research and Public Health, 18(22), p.11761. doi: https://doi.org/10.3390/ijerph182211761.

Contini, C., Fabio Boncinelli, Piracci, G., Scozzafava, G. and Casini, L. (2023*). Can blockchain technology strengthen consumer preferences for credence attributes?* Agricultural and Food Economics, 11(1). doi: https://doi.org/10.1186/s40100-023-00270-x.

Cozzio, C., Viglia, G., Lemarie, L. and Cerutti, S. (2023). *Toward an integration of blockchain technology in the food supply chain.* Journal of Business Research, 162, p.113909. doi: https://doi.org/10.1016/j.jbusres.2023.113909.

Creswell, J.W. and Creswell, J.D. (2017). *Research Design*. Google Books. Available at:https://books.google.ie/books?hl=en&lr=&id=335ZDwAAQBAJ&oi=fnd&pg=PT16&dq=Creswell [Accessed 13 Mar. 2025].

Deloitte (2023). *Sustainability survey | Deloitte Ireland*. Available at: https://www.deloitte.com/ie/en/about/press-room/sustainability-consumers-climate.html [Accessed 1 Apr. 2025].

Ding, Y., Zheng, D. and Niu, X. (2024). *Collaborative Green Innovation of Livestock Product Three-Level Supply Chain Traceability System: A Value Co-Creation Perspective.* Sustainability, 16(1), p.297. doi: https://doi.org/10.3390/su16010297.

Duan, J., Zhang, C., Gong, Y., Brown, S. and Li, Z. (2020*). A Content-Analysis Based Literature Review in Blockchain Adoption within Food Supply Chain.* International Journal of Environmental Research and Public Health, 17(5), p.1784. doi: https://doi.org/10.3390/ijerph17051784.

Fávero, L.P. and Belfiore, P. (2019). *Chapter 3 - Univariate Descriptive Statistics*. Available at: https://www.sciencedirect.com/science/article/abs/pii/B9780128112168000033 [Accessed 15 Mar. 2025].

European Commission (2023). *Horse meat (2013-14)*. Food Safety. Available at: https://food.ec.europa.eu/food-safety/eu-agri-food-fraud-network/eu-coordinated-actions/horse-meat-2013-14_en [Accessed 22 May 2025].

Finlay, C. (2025). *Half of Irish adults have reduced their spending in recent months - RedC Research & Marketing*. Available at: https://redcresearch.com/half-of-irish-adults-have-reduced-their-spending-in-recent-months/ [Accessed 1 Jul. 2025].

FSAI (2024). *Consumer Complaints to FSAI Advice Line Increase in 2024 | Food Safety Authority of Ireland*. Food Safety Authority of Ireland. Available at: https://www.fsai.ie/news-and-alerts/latest-news/consumer-complaints-to-fsai-advice-line-increa-(1) [Accessed 14 May 2025].

Global Wellness Institute (2024). *The global wellness economy reaches a new peak of $6.3 trillion—and is forecast to hit $9 trillion by 2028.* Available at: https://globalwellnessinstitute.org/press-room/press-releases/the-global-wellness-economy-reaches-a-new-peak-of-6-3-trillion-and-is-forecast-to-hit-9-trillion-by-2028/ [Accessed 5 Apr. 2025].

Goodier, M. (2024). *Olive oil fraud and mislabelling cases hit record high in EU*. The Guardian. Available at: https://www.theguardian.com/world/article/2024/jul/29/olive-oil-fraud-mislabelling-cases-record-high-eu [Accessed 22 May 2025].

Henderson, B. (2024). *€91 Million of Fraudulent Food Seized Through EU-Wide Operation in 2024*. Food-safety. Available at: https://www.food-safety.com/articles/9854-91-million-of-fraudulent-food-seized-through-eu-wide-operation-in-2024 [Accessed 22 May 2025].

IBM (2024). *IBM Food Trust overview.* Available at: https://www.ibm.com/docs/en/food-trust?topic=overview [Accessed 11 May 2025].

IFAC (2024). *Ireland, an Agrifood Exporting and Importing Island | Accounting & Financial Advisors | Ifac.* Available at: https://www.ifac.ie/news-insights/insights/ireland-an-agrifood-exporting-and-importing-island [Accessed 20 Nov. 2024].

Kline, R.B. (1999). *Book Review: Psychometric theory.* (3rd ed.). Journal of Psychoeducational Assessment, 17(3), pp.275–280. doi:https://doi.org/10.1177/073428299901700307.

KPMG (2022). *Agri-food 2030: edition 2 - KPMG Ireland.* Available at: https://kpmg.com/ie/en/home/insights/2022/06/agri-food-2030.html [Accessed 15 Mar. 2025].

Jordan, A. (2017). *Fipronil found in small quantity of imported eggs.* Farmersjournal.ie. Available at: https://www.farmersjournal.ie/news/news/fipronil-found-in-small-quantity-of-imported-eggs-300088 [Accessed 4 Feb. 2025].

Jose, H., Jackson, E.L., Duong, P. and Sung, B. (2025). *Ethical Food Consumption in the Digital Age: Consumer Attitudes Towards Digitally Monitored Animal Welfare in Pork Products.* Appetite, 207, p.107853. doi: https://doi.org/10.1016/j.appet.2025.107853.

Liu, H., Ma, R., He, G., Lamrabet, A. and Fu, S. (2023*). The impact of blockchain technology on the online purchase behaviour of green agricultural products.* Journal of Retailing and Consumer Services, 74, p.103387. doi: https://doi.org/10.1016/j.jretconser.2023.103387.

Martínez-Castañeda, M. and Feijoo, C. (2023). *Use of blockchain in the agri-food value chain: State of the art in Spain and some lessons from the perspective of public support.* Telecommunications Policy, 47(6), p.102574. doi: https://doi.org/10.1016/j.telpol.2023.102574.

McMullen, M. (2024). *FOOD TRANSPARENCY TRANSLATES TO TRUST: WHAT MANUFACTURERS NEED TO KNOW.* Available at: https://omnivoreagency.com/2024/07/31/food-transparency-translates-to-trust-what-manufacturers-need-to-know/ [Accessed 27 May 2025].

Meijer, G.W., Lähteenmäki, L., Stadler, R.H. and Weiss, J. (2020). *Issues surrounding consumer trust and acceptance of existing and emerging food processing technologies.* Critical Reviews in Food Science and Nutrition, 61(1), pp.1–19. doi: https://doi.org/10.1080/10408398.2020.1718597.

Montecchi, M., Plangger, K. and West, D.C. (2021). *Supply chain transparency: A bibliometric review and research agenda.* International Journal of Production Economics, 238, p.108152. doi: https://doi.org/10.1016/j.ijpe.2021.108152.

Nestlé (2019). *Nestlé breaks new ground with open blockchain pilot.* Available at: https://www.nestle.com/media/pressreleases/allpressreleases/nestle-open-blockchain-pilot [Accessed 2 Apr. 2025].

O'Regan, E. (2024). *One in three daily calories for Irish adults are from ultra-processed food – should be we concerned?* Independent.ie. Available at: https://www.independent.ie/irish-news/one-in-three-daily-calories-for-irish-adults-are-from-ultra-processed-food-should-be-we-concerned/a2120851190.html [Accessed 9 Dec. 2024].

Panghal, A., Pan, S., Vern, P., Mor, R.S. and Sandeep Jagtap (2023). *Blockchain technology for enhancing sustainable food systems: A consumer perspective.* International journal of food science & technology, 59(5). doi: https://doi.org/10.1111/ijfs.16835.

PWC (2023). Decision points: sharpening the pre-purchase consumer experience. Available at: https://www.pwc.ie/reports/irish-consumer-insights-pulse-survey-2023.html [Accessed 19 Oct. 2024].

Rahman, A. and Muktadir, G. (2021). *SPSS: An Imperative Quantitative Data Analysis Tool for Social Science Research.* Available at: https://www.researchgate.net/publication/355986638_SPSS_An_Imperative_Quantitative_Data_Analysis_Tool_for_Social_Science_Research [Accessed 12 Mar. 2025].

RTÉ (2023). *Expert: 88% of Irish people will be overweight by 2060.* Available at: https://www.rte.ie/news/2023/0303/1360047-overweight-obesity/ [Accessed 1 Dec. 2024].

Sharma, A., Bhatia, T., Singh, R. and Sharma, A. (2023). Developing the framework of blockchain-enabled agri-food supply chain. *Business Process Management Journal.* doi:https://doi.org/10.1108/bpmj-01-2023-0035.

Singh, A., Gutub, A., Nayyar, A. and Khan, M.K. (2022). *Redefining food safety traceability system through blockchain: findings, challenges and open issues.* Multimedia Tools and Applications, 82, pp.21243–21277. doi: https://doi.org/10.1007/s11042-022-14006-4.

Singh, V. and Sharma, S.K. (2022). *Application of blockchain technology in shaping the future of food industry based on transparency and consumer trust.* Journal of Food Science and Technology, 60. doi: https://doi.org/10.1007/s13197-022-05360-0.

Sristy, A. (2021). *Blockchain in the food supply chain - what does the future look like?* Walmart Global Tech. Available at: https://tech.walmart.com/content/walmart-global-tech/en_us/blog/post/blockchain-in-the-food-supply-chain.html [Accessed 1 May 2025].

Stimolo, S. (2023). *Authentic Parmigiano Reggiano is now blockchain certified.* [online] The Cryptonomist. Available at: https://en.cryptonomist.ch/2023/08/23/authentic-parmigiano-reggiano-is-blockchain-certified/ [Accessed 16 May 2025].

Treiblmaier, H. (2018). The impact of the blockchain on the supply chain: a theory-based research framework and a call for action. Supply Chain Management: An International Journal, [online] 23(6), pp.545–559. doi: https://doi.org/10.1108/scm-01-2018-0029.

Treiblmaier, H. and Garaus, M. (2023). *Using blockchain to signal quality in the food supply chain: The impact on consumer purchase intentions and the moderating effect of brand familiarity.* International Journal of Information Management, 68, p.102514. doi: https://doi.org/10.1016/j.ijinfomgt.2022.102514.

Tripathi, G., Ahad, M.A. and Casalino, G. (2023). *A Comprehensive Review of Blockchain technology: Underlying Principles and Historical Background with Future Challenges.* Decision Analytics Journal, 9(1), p.100344. Available at: https://www.sciencedirect.com/science/article/pii/S2772662223001844.

Vegconomist (2023). *ADM: 'The Future of Alternative Proteins Doesn't Stop With Plant Proteins'.* Available at: https://vegconomist.com/interviews/adm-the-future-of-alternative-proteins-doesnt-stop-with-plant-proteins/ [Accessed 2 May 2025].

Vern, P., Anupama Panghal, Mor, R.S. and Kamble, S.S. (2024). *Blockchain technology in the agri-food supply chain: a systematic literature review of opportunities and challenges.* Management review quarterly. doi: https://doi.org/10.1007/s11301-023-00390-0.

Xing, Y. and Jin, C.-H. (2023). *The Impact of Cultural Values on Attitude Formation toward Cultural Products: Mediating Effects of Country Image.* Sustainability, 15(14), pp.11172–11172. doi: https://doi.org/10.3390/su151411172.

Yontar, E. (2023). *The role of blockchain technology in the sustainability of supply chain management.* Grey based dematel implementation, 8, pp.100113–100113. doi: https://doi.org/10.1016/j.clscn.2023.100113.

Zhu, Q., Bai, C. and Sarkis, J. (2022). *Blockchain technology and supply chains: The paradox of the atheoretical research discourse.* Transportation Research Part E: Logistics and Transportation Review, 164, p.102824. doi: https://doi.org/10.1016/j.tre.2022.102824.

8. Appendix

Survey Questions Summary

2. Age

|	
● 18–24	12
● 25–34	28
● 35–44	45
● 45–54	19
● 55+	6
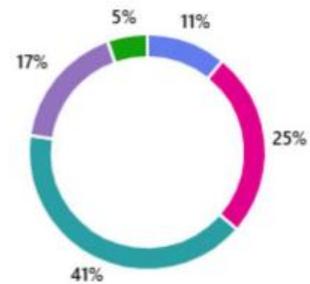
3. Are you the primary or joint decision-maker for grocery and food purchases in your household?

● Yes, I make all of the grocery and food purchase decisions	42
● Yes, I share decision-making equally with someone else	61
● No, but I provide input on what is purchased	3
● No, but I make occasional grocery purchases	4
● No, I am not involved in grocery or food purchases at all	0
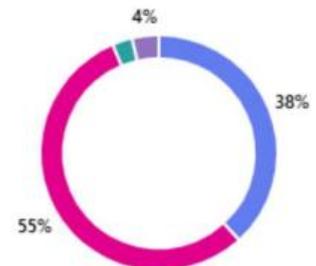
4. Rank your top priority when buying food:

● Price	31
● Nutritional value	39
● Sustainability & Ethical Sourcing (e.g., carbon footprint, animal welfare)	9
● Brand Reputation & Trust	30
● Local/Irish origin	1
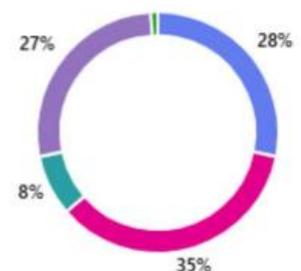
5. How often do you buy groceries?

- ● Daily — 4
- ● Multiple times per week — 9
- ● Weekly — 52
- ● 2–3 times per month — 45
- ● Monthly — 0
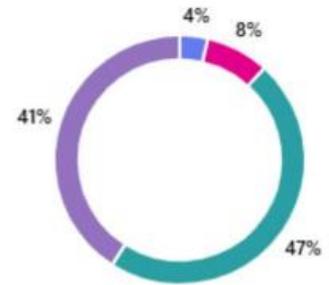
6. How important is "local sourcing" (e.g., Irish-made) to your food purchases?

- ● Extremely important — 5
- ● Very important — 36
- ● Moderately important — 37
- ● Slightly important — 20
- ● Not important — 12
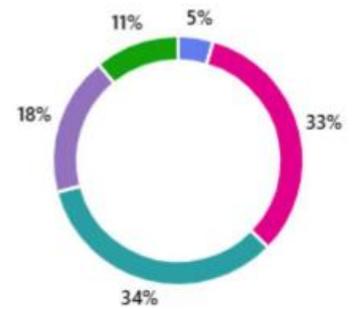
7. Do you actively check labels for certifications (e.g., Bord Bia, Fairtrade)?

●	Always	11
●	Very often	32
●	Sometimes	41
●	Rarely	20
●	Never	6

5% 10%
18%
29%
37%
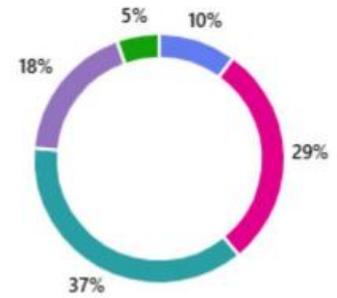
8. How important is it to you that food companies disclose where ingredients come from?

●	Extremely important	75
●	Very important	22
●	Moderately important	8
●	Slightly important	3
●	Not important	2

7%
20%
68%
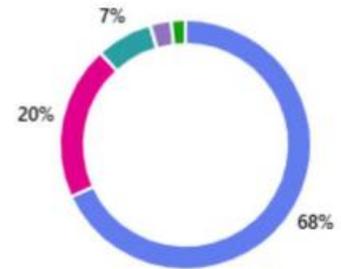
9. How familiar are you with blockchain technology?

●	Never heard of it	21
●	Heard of it but I do not understand it	24
●	Basic understanding (e.g., digital ledger)	34
●	Moderate understanding	18
●	Very familiar	13

12% 19%
16%
22%
31%
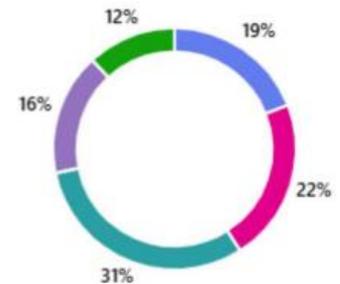
10. Have you encountered blockchain in the context of food supply chains?

●	Yes, frequently	1
●	Yes, ocasionally	4
●	Not personally, but I know about it	30
●	No, never	52
●	Unsure	23
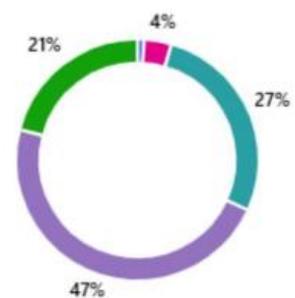
4%
21%
27%
47%

11. **Blockchain can track a food product's journey from farm to store. How useful do you think this is?**

●	Extremely useful	85
●	Somewhat useful	12
●	Unsure	3
●	Not useful	1
●	I do not understand blockchain	9
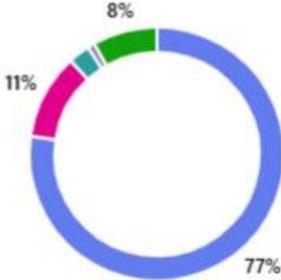
12. **Blockchain can improve transparency in food sourcing. How useful do you think this is?**

●	Extremely useful	87
●	Somewhat useful	12
●	Unsure	2
●	Not useful	0
●	I do not understand blockchain	9
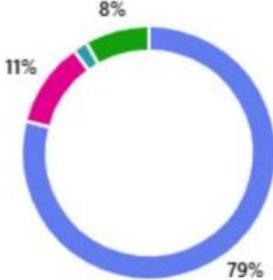
13. Would blockchain increase your trust in the ethical and sustainability claims of food brands?

● Yes, significantly	42
● Yes, somewhat	19
● Maybe	44
● No, I do not trust blockchain for this purpose	3
● No, it would not make a difference	2

38%
40%
17%
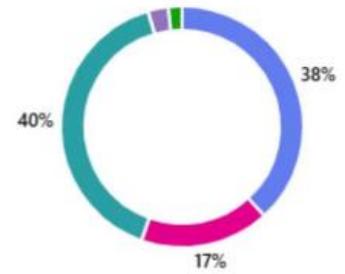
14. Would you pay more for a food product if blockchain guaranteed its ethical sourcing?

● Yes, up to 5% more	16
● Yes, 6–10% more	11
● Yes, 11–15% more	1
● Yes, but it depends on the product	50
● No, I would not pay extra	32

15%
29%
10%
45%
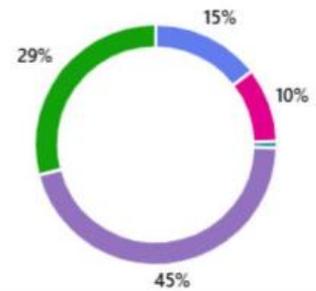
15. What top factor that would justify paying a premium for blockchain-tracked food?

|	
● Full transparency & traceability	50
● Improved food safety	11
● Verified ingredient origins & quality	25
● Verified ethical sourcing & sustainability claims	14
● Support for local producers	10

9%
13%
45%
23%
10%
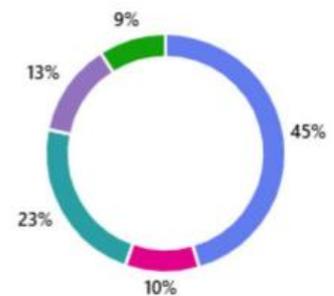
16. Which type of sustainably or ethically sourced food product would you be most willing to pay a premium for?

|	
● Fresh produce (e.g., fruits, vegetables)	27
● Dairy products (e.g., milk, cheese)	14
● Meat and seafood	65
● Packaged goods (e.g., snacks, cereals)	1
● Other (e.g., coffee, chocolate, tea)	3

25%
13%
59%
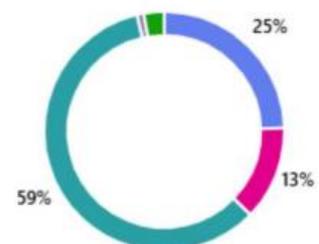
17. What is the biggest barrier to your acceptance of blockchain?

- ● Lack of awareness — 24
- ● Distrust in the technology — 6
- ● Preference for traditional labels — 28
- ● Cost concerns — 36
- ● Uncertainty about its real benefits — 16
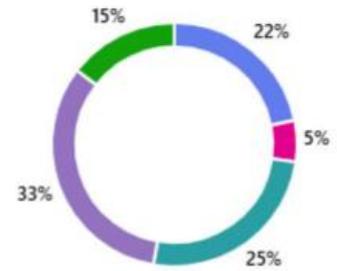
18. What concerns you most about blockchain in food systems?

- ● Data privacy risks — 32
- ● Complexity of the technology — 23
- ● Increased food prices — 27
- ● Reliability and accuracy of blockchain data — 23
- ● No added value — 5
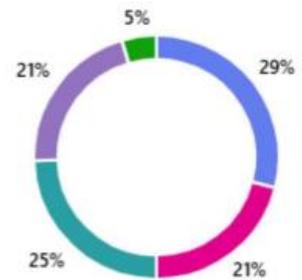
19. Would better education about blockchain increase your trust in it?

- ● Yes, definitely — 32
- ● Yes, somehow — 20
- ● Maybe — 54
- ● No, I remain skeptical about blockchain — 1
- ● No, I already trust blockchain enough — 3
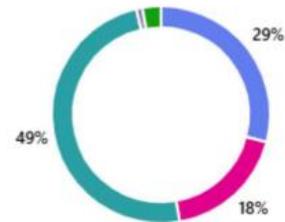
20. Do you believe Ireland's strong local farming traditions and perceived quality of local food reduce the necessity for blockchain traceability in domestic food supply chains?

- ● Strongly agree — 0
- ● Agree — 23
- ● Maybe — 26
- ● Disagree — 33
- ● Strongly disagree — 28