VILNIUS UNIVERSITY
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“Effect of shelf life of food products and perceived risks on intention to buy products”

Master thesis

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Abstract

This study explores the effects of shelf life and perceived risks on consumer purchase intentions in the food industry, focusing on online and traditional retail settings. Shelf life is a critical determinant of product quality, safety, and consumer trust, while perceived risks such as safety, financial, and delivery uncertainties significantly influence consumer decision-making. The study identifies a research gap in integrating these factors, particularly in the context of online food shopping, where concerns about product freshness and reliability are heightened.

This study used a quantitative approach; thus, data were gathered through structured questionnaires from 390 respondents. Key constructs were measured using validated scales-that is, shelf life perception, perceived risks, and purchase intentions. It appears that greater shelf life influences purchases positively especially when related to products described as environment-friendly, whereas the perceived risk decreases consumer's confidence and the purchase intention. Further, it seems that the relationship between the perceived risks and purchase intentions was conditioned by information regarding shelf life and, thereby the need for accurate labeling. This research calls for better shelf life communication, innovative preservation technology, and practical strategies that help to reduce perceived risks, bringing forth practical implications for food producers, retailers, and policymakers. All these factors addressed can help businesses in their respect toward consumer trust, lower food waste, and alignment with sustainability goals in a competitive market.

Keywords: Shelf Life, Perceived Risk, Consumer Behavior, Purchase intention, Online Food Shopping.

INTRODUCTION

The food industry all over the world has changed dramatically in the last decade because of the new ways in which people perceive the safety, quality and sustainability of food (Stampa et al., 2020). Within the given options, one of the most essential determinants of consumer behavior is the actual shelf life of the food products, which constitutes the basis for perceiving the quality and safety of the food product (Sheth, 2020). The shelf life is a very sensitive aspect in the food product as it defines how long the food can be in the shelf before it becomes unfit for consumption (Lyu et al., 2020). According to the FAO, 3 billion tons of food are wasted every year worldwide and a good portion of this is attributed to food spoilage due to poor shelf-life management (Munekata et al., 2020).

Customers have realized that there are some certain dangers that they can meet with whenever they are consuming food products and these includes freshness and safety (Han, 2021). Similarly, a new survey work conducted by the International Food Information Council (IFIC) in 2023 reveled that amount consumers were very concerned about the safety of the foods they eat and price (Habib &Hamadneh, 2021); 62% of consumers mentioned that food safety was a crucial decision making factor, while 48% were concerned about getting sick from consuming foods which were beyond their shelf life (Chen et al., 2022). This growing concern has forced food manufacturers to seek ways of enhancing the shelf life of their products and in the process alerting consumers (Rajasa et al., 2023).

These concerns have caused the food industry in the United States to pursue more innovative techniques in preservation and better packaging (Pillai et al., 2022). Approximately $18 billion as stated by different market studies was the value of the food packaging market in the U. S. 5 billion in 2022, with a compounded annual growth rate of 5 per cent. 2% for the period up to 2028 (Mordor Intelligence, 2023). These inventions aspire to preserve the frailty of food products so that they can be in demand for a longer period, not to mention diminishing food waste and improving the consumer's trust in the products' safety and quality (Munekata et al., 2020).

Nonetheless, the technological advancement still has perceived risks as a component of the factors that hinder consumers from embracing food from the online retail stores (Munekata et al.,

2020). The impact of the COVID-19 pandemic is in increasing the rates of online grocery sales as the global online grocery sales have reached $198.3 (Pillai et al., 2022) compound annual growth rate to reach $ 73 billion in 2023, The figure is based on a 13.5% rise (Statista, 2023). However, in 2022 NielsenIQ survey, 45% of consumers still avoid purchasing perishable foods online resulting to the freshness issue and fear of bacteria spread throughout the delivery process (NielsenIQ, 2022).

Lack of information and perceived risks are other matters that give a relationship between shelf life and purchasing intentions, and the increasing focus on transparency in labeling food items (NielsenIQ, 2022). According to a consumer survey undertaken by Deloitte (2021), 68% of consumers seek clear labelling of the shelf life and storage conditions on the food packaging (Deloitte, 2021). Also found out from the survey was the fact that consumers prefer to patronize brands that give detailed information on issues to do with shelf life as well as safety procedures (Pillai et al., 2022).

These statistics support the idea that shelf life is one of the most influential factors that affect consumer in the food industry (Pillai et al., 2022). With the ever rising awareness and expectations of consumers regarding food safety and quality, it is imperative that the relationship between shelf life, perceived risks and the consumers' intended purchase decisions should be better understood by the food producers and sellers (NielsenIQ, 2022). This research seeks to establish these dynamics in order to get information that will be useful in how to upgrade product line, how to build customer confidence and in effect leading to the purchase of the products in a highly competitive world (Munekata et al., 2020).

Problem of Research

The issue considered in this research is the increased uncertainty of the consumer's decision-making about food products with regard to shelf life and perceived risks. Due to this the food industry has been rising and opening up new sub-industries such that the consumer is now presented with numerous options to weigh in terms of convenience, quality, safety and sustainability. Despite new developments in food preservation and better labeling, a considerable population of the population remains suspicious of the safety and quality of foods, particularly the 'expired' kinds. This skepticism is even more prevalent when shopping groceries online since customers are likely to perceive even more risks when buying perishable foods, as well as the

often unreliable processes of food delivery. Furthermore, cases of food safety and product recalls have informed the consumers increased the level of scrutiny of shelf life info and the dangers of consuming potentially contaminated products. These conditions do not only affect the decision-making process of the consumers but also the issues of food waste, consumers' trust, and the effectiveness of the marketing strategies within the sphere of food industry. The research aims at investigating these issues by analyzing two practical concerns in relation to food products shelf life and perceived risks regarding the intention to purchase the products with the view of filling the gap in the understanding of consumer behavior in the modern food market.

Research Gap

Despite the vast number of studies conducted to investigate the various factors that influence consumers' decisions in the food industry, there is still a research gap with regards to an integration of shelf life and perceived risks on the choice intentions of customers in online food purchasing. Although there exists some research on shelf life and perceived risk separately, none of them has investigated the moderation of shelf life, and how this combination affects consumers' trust and their decision-making. Furthermore, the emergence of online grocery shopping raises a set of complex issues related to the perceived risks and, therefore, the necessity of understanding how accurate and easily understandable, the respective shelf life information influences such behavior. This research aims at filling this research gap by offering a better understanding of the factors that define the shelf life as well as perceived risks when used to inform consumer behavior in a digital retail context.

Research Aims and Objectives

Aim: The aim of this study is to examine the effect of shelf life of food products and perceived risks on intention to buy products.

Research Objectives:

1. To examine the effect of shelf life on perceived consumer buying behaviour for food items.

2. To understand the impact of perceived risks on consumer trust and behaviour when purchasing food products.

3. To examine the connection between shelf life information with perceived risks for consumers in online food shopping.

1. LITERATURE ANALYSIS

1.1 Shelf life and its implication to the consumer behavior

A case of the subject matter you have chosen is found in Munekata et al. (2020), where the authors describe the necessity of increasing the shelf life of meat products through the use of plant extracts. They illustrate how the application of this practice not only helps to extend the shelf life but also to intensify health-beneficial characteristics of the products. Universally, this is pivotal in responding to the consumers' needs for quality and healthfulness in food products.

Schipmann-Schwarze, et al., (2020) analyze consumers' attitudes and practices regarding pastured animals products. They learn that consumer, in general, have a tendency to buy these products because of perceived enhancements in their health status or humane treatment of animals. These preferences point towards the need to have the right marketing techniques that will put much concern on the natural and ethical methods that is used in the production of the products in order to steer the buying behavior of the customer towards the intended products.

Han (2021) explores consumers' consumption patterns in relation to ECC in the tourism and hospitality industries. The study also reveals the increase in consumers' knowledge and concern for CSR, a tendency reminiscent of the food business where consumers search for products with prolonged shelf life and minimal environmental effects.

Sheth (2020) reviews the consumer behavior changes during the pandemic caused by COVID-19, stating an overall focus on health awareness and minimizing risks. These changes are expected to persist, thus having long-term effects on the purchasing behavior, particularly concerning food products where the factors such as shelf-life and safety gains more significance.

Lyu, et al., (2020) review different techniques relating to state of health estimation and remaining useful life of Li-ion batteries. While their study is not in the field of food, the approach of utilizing useful life prediction resembles the estimation of shelf life in food items. Precise forecasting of shinney could strongly contribute for building up the credibility and customer satisfaction.

There is a comprehensive analysis of how the shelf life of foods influence consumer behavior affirmed by various studies in various setting in this aspect. The strength is lies in its broaden

strategic concept, makes comparison with the food products to other sectors including Li-ion batteries sector, where durability and customers' trust are decisive factors. However, one emerge area is that the literature review may require an integrated approach that directly connects these diverse findings to the focus of this research; that is, shelf-life of foods. Also, the aspect presenting consumer attitudes toward ethical and health concerns is relevant to develop further, especially in terms of its relation to people's perceptions of the shelf life, in the context of the post-pandemic mentality. Speaking of limitations of this part of the analysis, it can be stated that it is rather solid, yet, there is still some potential for it to be made stronger: the connections between the studies are quite loose, and the focus on the implications for the food industry stakeholders is not as explicit as it could and should be.

Summary: The review focuses on effects of shelf life on consumer behavior especially In foods products and proposals that shelf life of foods especially meats should be elongated through natural preservatives such as plant extracts to fit consumer needs. Other research also underlines customers' awareness of ethical and environment friendly products in food and other fields like battery life prediction. In view of this, the analysis recommends that research should bridge the gap between conclusions and demonstrate clearer linkages to the implications of the findings to stakeholders relevant to the food industry particularly in the post COVID-19 period.

1.2 The Role of Shelf Life in Consumer Purchase Decisions

In their model, Rajasa et al. (2023) described the most significant factors that have an impact on the buying decision and these are the quality of the product and the price offered by the sellers. Therefore, the study reveals that shelf has life as an essential aspect of product quality as it influences consumer confidence and perceived quality. This time factor typically guarantees longer quality and less spoilage, which are critical factors that influence consumers' decisions in their purchase.

With reference to Zhang and Dong (2020), the authors conduct a systematic review to analyse the antecedents to consumers' green purchase intentions. Thus, they discover that the aspect of shelf life is a major concern in green purchase since consumers seek items with long shelf life to reduce wastage and its effects on the environment. This appears to be rising in consonance with

other sustainability aspects, in continuation of a trend that puts emphasis on shelf-life in consumers' buying behaviors.

Mbete&Tanamal (2020) analyzed easiness, service quality, price, trust in quality information, and brand image of the items bought through shopee. Some of them point out that shelf life information is useful in Internet selling where customers depend on the descriptions made. Thus, some customers pay attention to the shelf life of the products and clear and accurate information of the shelf life of the products may enhance their decisions to purchase positively.

In this study, Cordova et al., (2020), endeavor to establish how visual merchandising influences the buyers to make purchases in the retail stores in central region of Peru. Regarding the main research question, they concluded that the attention to the relevant information and improved perception of the shelf life have the potential to attract consumers' attention and improve the perception of the quality of products. These elements tend to influence purchases in a retail setting thus; effective visual merchandising that incorporates the details of shelf life can greatly affect purchase intentions.

Eye-tracking study of Chen et al. (2022) investigates the effect of online reviews on consumer's buying behavior. They establish that consumers are keen when it comes to product reviews with sentiments relating to shelf life. Such features as shelf-life extension are generally received well in the market since people are more likely to consume the product when they know it will not expire soon. This shows that shelf life is one of the attributes consumers look at when going through the review.

According to Rajasa et al. (2023), shelf life was noted to be closely related to the quality of the product that one is selling and also the cost of the product being sold in the market. Liquids with longer shelf life are expensive because they are assumed to be superior in quality compared to the other products. The customers are willing to spend a substantial amount to get these products for which shelf life is considered a critical aspect.

Zhang and Dong (2020) also stressed that consumers' green purchase decisions are affected by products' shelf life duration. This generation wants to consume goods that satisfy their current necessities and at the same time, are environment-friendly. Longer shelf life decreases the rate of buying and food waste which needs to be in line with sustainable consumption.

Mbete and Tanamal (2020) describe how consumers' reliance on the quality of information, such as shelf life, contributes to the choice of online purchases. Information is power; to this end, consumers require factual details to enable decision making regarding the product and the platform, with factual shelf life details making the consumers confident in the shelf life of the products hence leading to higher purchase intentions.

According to Cordova et al. (2020), visual merchandising communication should then include details about the shelf life of the concerned items so that they grab the attention of the concerned buyer. Thus, it would be possible for retailers to tailor their strategies according to the needs of buyers, namely their need to obtain fresh and high-quality products that will have a longer shelf life.

Another study by Chen et al. (2022) affirms that mentioning the shelf life of products within the reviews has a vital impact on the perceptions of consumers. This is because positive mention can also offset the issue of freshness and perceived reliability of the product and hence increase the purchase rate.

Accordingly, Rajasa et al. (2023) confirm the significance of understanding the motives that impact the buying choices, like shelf life, for improving the business attractiveness. Therefore, it is pivotal for business to extend product shelf life and transmit this information to prospective consumers as a way of positioning themselves favorably among the consumer fraternity that desperately looks for quality products.

According to Zhang and Dong (2020), advertisers should extend the shelf life of green goods as this appeals to the green consumer. One of the essentially distinguishing features of such products is possible increased shelf life, so that giving more attention to it can become a selling point.

Mbete and Tanamal (2020) affirm that due to the prominence of online sales and purchases, there is need to describe shelf life information for products. Relevant information can decrease the level of perceived risk, consequently, enhance trust and the decision to buy online.

From the literature, Cordova et al. (2020) advise retail stores' to incorporate into visual merchandising, putting into consideration information about the shelf life. This approach may help inform the consumer about the quality of the products should they make a purchase.

Chen et al. (2022) also state that firms should pay attention to some of the common negative comments in regard to shelf live. Such positive comments regarding extended periods should be brought to the notice of potential customers with a view to making them buy the products.

The analysis in this aspect goes a long way in emphasizing the importance of shelf life as one of the deciding factors householders' buying behaviors as affirmed by several scholars. The strength is that it is linked to shelf life, product quality, the environment, and consumer trust of the given product when purchased over the internet and viewing shelf-life in terms of merchandising. However, there is a clear potential for a more coherent discussion that join the different dimensions more closely and show how shelf life is at the centre of a web of consequences affecting consumer perceptions, prices, and sustainability. Moreover, as for the limitation of the analysis, it points out the factor of communication of shelf life, but it seems to be insufficient for the detailed presentation on how the businesses can gain competitive advantage by applying this type of information to improve consumer's confidence and intention to buy the product across every departmentalized market segments. In general, this aspect presents a solid ground but it can be enhanced through having closer links between these factors and stressing upon the marketing implication.

1.3 Perceived Risk in Online Food Shopping

Consumers' perceived risk towards the use of technology is examined by Habib &Hamadneh (2021) in the context of online grocery shopping during COVID-19. They learn that the perceived risks, for instance on the quality of products and the safety of delivery increase the consumers' reluctance to be associated with internet grocers . The pandemic has made these factors even more significant and has turned them into the determinants of the acceptance and usage of technologies.

Pillai et al. (2022) use the Theory of Planned Behavior in conjunction with the Theory of Perceived Risk and the Elaboration Likelihood Model to investigate consumers' purchase intentions of OED services. What their research shows is that a number of perceived risk factors such as financial risks, privacy risks, and delivery risks are also very influential to the decision making process of consumers. Familiarizing these risks will assist the service providers in

addressing the issues that consumers have and thus improve the confidence they have in the platform.

In their study, Amirtha, Sivakumar, and Hwang (2020) look at the moderation of the perceived risk dimensions on e-shopping on women consumers' behavioral intentions based on family life cycle stage. They determine several risk factors including financial risks, product risks, and delivery risks that influence women's WOS differently depending on their life cycle. Such a perception is useful in coming up with measures to address risks for certain groups of consumers.

Specifically, Ilhamalimy and Ali (2021) looked at the effects of perceived risk and trust on individuals' intentions of purchasing products on Shopee Indonesia. There is a focus on the moderator role of trust, and it is respectively proved that the perceived risks affect the purchase intention in the negative way, however, the trust have a potential to reduce these negative impacts to a greater extent. This study gives emphasis on the concept that perceived risks can be lowered by economical measures focused on trust building for further improvement of the experience related to online shopping.

Alrawad et al. (2023) apply structural equation modeling on customers' data to understand the risks' perceived in Online shopping across the groups. It is their work that they found out that what others may consider risky like security or privacy issues differ in various demographics affect their purchase behavior on the net. This sheds light on the fact that there is a need to continuously assess a company's risks as it owes it to its consumers to develop different risk management policies for various consumer segments. Habib &Hamadneh (2021) insist that perceived risks, which have been worsened by the outbreak of COVID-19, are among the key ATO barriers for online grocery shopping. Mitigating these risks would go a long way in boosting customer confidence as well as acceptability of online grocery services.

According to Pillai et al. (2022), these perceived risks affect the consumers' purchase intentions towards OFD services, and when these risks are properly addressed, it would lead to increased purchase intentions. Some of the measures that service providers can take to combat consumer fear include as follows; safe payment means, clear delivery procedures, and strict consumer's privacy. Amirtha, Sivakumar, and Hwang(2020) explain how perceived risks do not have the same level of effect in all the stages of the family's life cycle. Hence to overcome the barriers of

e-commerce platforms, it becomes possible by understanding the needs of women at various stages of their life cycle so as to adopt e-commerce facilities in the flow of consumerism.

Based on the perceived risks element, Ilhamalimy and Ali (2021) reveal that a degree of trust helps to minimise the adverse impact of such risks. E-commerce firms must improve the reliability and credibility of the information presented to consumers apart from customer ratings and feedback and adequate customer support.

In a study, Alrawad et al. (2023) goes further to explain that risk perception concerning online shopping depends on demographic factors. Retailers should factor these considerations in the methodologies used in risk management to avoid formulation of unnecessary mitigations for various client segments. Thus, Habib &Hamadneh (2021) state that perceived risks are a major factor influencing the extent of technology acceptance for purchasing groceries online during crises like the COVID 19. Minimizing these risks can improve Consumer Take On and satisfactions. As the synthesis of various extant theories, Pillai et al. (2022) can help shed light on the antecedents of customers' purchase intentions regarding ODFs. They stress on the need to manage perceived risks in order to increase customers' confidence and purchase intentions. According to Amirtha, Sivakumar and Hwang (2020), it is important for e-commerce platforms to segment the risk management strategies that would apply depending on how women at different family life cycle stages perceiving risks.

In one article, Ilhamalimy and Ali (2021) advocate that trust enhancement activities are vital in mediating the results of perceived risks in the client's buying decisions. It is important to stress that effective building of trust can effectively translate such perceived risks to the benefits of improving the level of customer loyalty.

Alrawad et al. (2023) suggest that online retailers should be more specific in the strategies applied in relation to the gender, age and marital status of the consumers. By increasing the level of consumer satisfaction, which will be achieved by the given approach, online shopping will acquire a broader coverage than it has at present. This part of the analysis is useful to emphasize the importance of perceived risk factor in influencing the consumer behavior in the online food purchase occasioned by the COVID-19 pandemic. Being an extremely diverse discussion of how the perceived risks that include the financial risk, privacy risk, and the delivery risk affect different consumer segments supported by the theoretical framework of Theory of Planned

Behavior and the Elaboration Likelihood Model. However, there is still a gap that lies in the study of interrelated risk factors and association of such risk factors with management solutions, particularly suitable for e-commerce platforms. However, in the analysis, the aspect of trust building as one of the risk mitigation issues could have received more attention, detailed investigations on demographic factors, such as gender and the lifecycle stages affecting perceived risk and how effective risk management strategies could further boost consumer confidence are still lacking. In general, this aspect is quite sound and presents a solid platform for movement though it might have been useful to place more emphasis on real-world implications for online retailers and concrete steps that such merchants can take to minimise perceived risks and increase consumer confidence.

1.4 Correlation between Shelf Life and Perceived Risk

Wu, Chiu, and Chen (2020) explored the factors influencing the online impulse buying using perceived risk, expectation-confirmation theory, and flow theory. They note that perceived risk plays a huge role in consumer attitude during the online shopping process. Lack of, or access to shelf life information influences perceived risk, especially associated with quality and safety of the product, which influences impulse buying. Yıldırım and Güler, (2021) examined the perception of risk about COVID-19 decreases happiness and increases death distress. Their study also supports the notion that an increase in perceived risks raises the level of anxiety and decreases the level of well-being. This psychological response is pertinent to food products likewise; when there are smells of spoilage or when shelf life is an issue, perceived health risks shoot up and effect consumer contentment and confidence in the product.

Yi, et al., (2020) study the perceived risk impact on the sharing economy in tourism employing Airbnb. They discover that perceived risks, for example, pertains to safety and hygiene, may lead to adoption reluctance. Likewise, in the case of food products, the perceived threat regarding shelf life can become the reason for rejection of a certain product as people are afraid of buying something that might cause them harm if it is expired or close to expiry. Siegrist and Árvai (2020) consider lessons that can be learned from 40 years of risk perception study and actuality, which described the fact that perceived risk is a function of familiarity, knowledge, and trust. Concerning the aspect of shelf life, these factors determine how consumers perceive the risks of foods. Increased awareness and understanding have an impact on perceived risks which lead to

the improvement of shelf life and confidence. Sperling, (2021) looks into ethical issues and perceived risk among the nurses during the COVID-19 outbreak. It is noticeable that perceived risk can cause great amount of stress and ethical issues. In the same way that stress and ethical concerns may present similar difficulties for consumers, the same plays out when buyer is trying to decide simply whether the food products to buy have a doubtful shelf life information, thus the need to provide clear and accurate information.

Wu, et al., (2020) stress that perceived risk can be reduced with the help of the clear information regarding the shelf life of products, which is important for the making of the impulse purchase on the Internet. Satisfying the customers' need for knowledge about shelf life can help to appease their concerns and contribute to more impulse purchases. According to Yıldırım and Güler (2021), when perceived risks are reduced, general satisfaction seems to rise. When it comes to the shelf life of the food products it is suggested that conspicuous display and clear readability of the information are capable of helping to diminish the level of anxiety experienced by consumers and consequently increase trust in the products.

Yi, et al., (2020) suggested that perceived risk represents one of the key factors explaining the usage of services in the sharing economy. This has implications to the food industry where existence of real risks are dispelled and the consumer is encouraged to make a purchase on the basis of shelf life.

According to Siegrist and Árvai (2020), consumers' level of knowledge and awareness of the shelf life are ways of mitigating perceived risks. Awareness raising campaigns as well as clear labeling systems assist consumers in making the correct choices, which in its turn, reduces stress and increases confidence.

Sperling (2021) explains that perceived risks cause ethical issues and stress. In regard to food consumers, it proves that definite information about the shelf life of a certain product may prevent such choices and decrease stress, thus, making the decision more confident for the consumer. Wu, Chiu, and Chen (2020) affirm that perceived risk influences the online shopping behavior, including foods products' purchase. Addressing shelf life issues through clear and accurate information about the same can minimize such risks and result in consumers' purchase.

According to Yıldırım and Güler (2021), where all the perceived risks are reduced, the consumer happiness is increased. Eliminating potential problems in relation to health giving food products minimal and accurate shelf life data can go a long way in improving the wellbeing of the consumer.

Yi, et al., (2020) suggest the ways of reducing perceived risks, that can be relevant for the food industry and the sharing economy. Overcoming the above perceived barriers entails offering adequate information on shelf-life, which help to dispel consumers' fears and influence their decisions to adopt and purchase the technology. Hellström and Sundström (2016) note that trust and knowledge decrease perceived risk level while Siegrist and Árvai (2020) stress the fact that trust and knowledge reduce perceived risks depending on the context. In the food product context, organizations need to invest in effective shelf life communication to reduce perceived risk and increase consumers' confidence.

Sperling (2021) has discussed about how perceived risk influences decision and ethical issues. Definite information concerning the shelf-life could assist consumers to make ethical and confident purchases decisions, thus improving their lifestyles and lowering down their stress levels.

In this regard, this aspect of the analysis does help to capture essence of the relationship between shelf life and perceived risk and to underline how the optimisation of shelf life information can go a long way to alleviating perceptions of risk and increase trust. The strength of this discussion is that it covers a wide range of studies indicating how perceived risk influences consumers' behaviour in different settings, from impulse buying on the Internet to general psychological effects during the COVID 19 pandemic. Nevertheless, there is the lack of a more integrated focus on need satisfying patterns, these various kinds of examples are not connected by showing how trust, knowledge, and clear communication about shelf life are firmly the instruments which help to minimize perceived risks. In the same way, the analysis briefly reflects on shelf life as a means of mitigating perceived risks with a view to recommending practical directions that stakeholders in the food industry ought to undertake in the effort of improving consumer confidence through better shelf life communication. Overall, this aspect is satisfactorily good but there is possibility to enhance it: the main findings should be integrated and the main points should be oriented more on the practical application for the industry.

1.5 Impact of Shelf Life on Different Categories of Food Products

Nile et al. (2020) indicate the uses of nanotechnologies in food science where they show the ability of nanotechnologies in increasing the shelf life of various foods. They mention last findings and prospective in nanotechnology and focus on how it can help improve preservation processes. This technology is most helpful for the items like fruits and vegetables, widely affecting their shelf life and level of spoilage.

In one update, El Khetabi et al., (2022) discuss the application of plant extracts and essential oils against postharvest fruit pathogens and fruit shelf life. Thus, their results confirm that natural preservatives can be useful to preserve the fruits and their quality because the mentioned products are usually perishable. It also helps prolong the shelf life of the products and at the same time can be considered more organic and free from chemicals that are preferred by the consumers.

In their paper titled: Innovations in nanoscience for sustainable food and agriculture development, Ashraf et al. (2021) articulate on new developments made in the field of nanoscience. They highlight the effects of these technologies on health and the environment: while Vo (2013) for instance observes that, nanotechnology has the potential of increasing the shelf life of food products in various categories. They are of most value in meat and dairy products sub-sectors because the products need special methods of preservation to make them safe and saleable. Lupan (2021) analyze the opportunities of using edible packaging to preserve the quality of foods and beverages. And, they introduce new and refreshing trends in food packaging which not only isolates the food from even getting a contamination chance but also helps in preserving it for a relatively longer time. Packaging is vital in bakery products and ready-made meals since they often include additions that make the product shelf life shorter as they are prepared to be consumed immediately; thus, this innovation is most appropriate in this industry.

Ncube et al., (2020) presented an environmental analysis on the food packaging materials with the replacement of conventional plastics by PLA based materials. In this regard, they describe how innovative packaging forms positively impacts preservation of numerous food products on the shelves as it considers the environment as well. The change of focus towards sustainable packaging material is even more effective on the products like the beverages and snack foods

because both the aspects of increase in shelf life and use of eco friendly packing materials are highly sensitive and important.

In their article, Nile et al. (2020) highlighted on how nanotechnology helps in the preservation of perishable food products. Incorporation of nanotechnology in food packaging and preservation techniques can effectively increase the shelf life of fruits and vegetables thereby minimizing cases of spoilage and hence waste. In the work of El Khetabi, et al., (2022), it was established that plant extracts and essential oils help in delaying the ripening of fruits and their shelf life. These natural preservatives serve as the means of enhancing the quality end safety of fruits in a way that will appease the consumer's growing concern when it comes to natural method of preserving foodstuffs.

In their study, Ashraf et al. (2021) speaks on how nanoscience interventions contributed to the preservation of the shelf life of meat and dairy products. These are amongst some of the important technologies needed to safeguard food perishing items and promote wholesome production of foods for consumption.

Consequently, Petkoska et al. (2021) have called for utilization of edible packaging to increase the shelf life of baked products as well as convenient ready-to-eat meal products. Printed food packaging is vital in the protection of food from contamination, while at the same time being a safer and efficient means in maintaining the freshness of the foodstuffs.

Ncube and Muzenda (2020) also talk of the move to the use of PLA based-packaging materials and its success on shelf lives' elongation. FMCG products that are likely to benefit from sustainable packaging include beverages & snacks because the solutions prolong their shelf life while considering the ecological impact.

According to the findings of Nile et al. (2020), there is a enormous prospect of applying nanotechnology so as to promote the shelf life of short-lived various foods. It is useful to note that such an application of technology can help decrease wastage and increase the means of harvesting and storing fruits and such vegetables, which is inline with sustainability.

Another study done by El Khetabi et al. (2022) argue that plant extracts and essential oils are good natural sources of biotechnologically active agents that enhance shelf life of fruits. Their use complies with the end-users' expectations of organic foods and improves food quality.

According to Ashraf et al. (2021), new developments in nanotechnology can take the shelf life of meat and dairy products to another level. They point out the need for such advancements in order to sustain the safety and quality of the products being produced; for sustainable agriculture.

According to Petkoska et al. (2021) edible coating is a sustainable solution to increase the shelf life of bakery products and ready to eat meals. This is simply a creative way of packing food so that it does not get contaminated and goes a long way in helping in its preservation.

Ncube et al. (2020) have particularly highlighted the environmental advantages of shifting to PLA based packaging materials. Such sustainable packaging ideas help to preserve the freshness of various drinks and snacks for a longer period of time and at the same time help to minimize the negative effects on the environment.

This aspect of the analysis also as explicitly discusses the shelf life across categories of the food products and enlightens on nanotechnology, the edible package and natural preservatives as some of the innovations that serve to lengthen the food shelf life. But there is just one major weakness, namely, the analysis itself is rich with details of how such improvements benefit not only product durability but also consumers' sustainable choices. Though, the flow seems to be missing a stronger and closer connection between these technological improvements and consumers' behavior especially in regards to how such advancements affect consumers' decisions in the food industry in relation to various food group categories. Moreover, while the critique tends to focus on the environmental impact that sustainable packaging has on the planet, the critique could have been twice as productive by providing a more detailed discussion on the application of these technologies in real lives and industry. Finally, this aspect offers a good grounding but needs more reinforcement: the technologies developed should be linked more directly to their market impact and to the consumers' attitudes.

1.6 Consumer Attitudes Towards Shelf Life in Various Market Segments

Other recent studies by Sánchez-Bravo et al., (2020) focuses o; consumer perception on the sustainability of food categories and found out that there is more preference on the foods with long shelf lives. They discover that productivity is linked to long shelf-life benefits, which includes less food wastage, something which is important to them concerning sustainability. It is

mostly evident in areas like packaged and processed foods as consumers prefer products they can use for an extended period.

The consumers and these innovations, in the context of food product development, is examined by Guiné et al. (2020). According to them, the consumer's propensity for new foods and beverages with this characteristic of long-lasting preservation without reduction in the quality is growing. This interest cuts across the demographic market where people care for their health and that of their families, and busy people who would have no time to prepare their meals, they care for the longevity of the foods and the ease of preparing them.

De Corato (2020) conducted a literature review on various technologies applied to the postharvest management of fresh and M&P fruits and vegetables. The review is echoed by the fact that the attitudes that consumers make when purchasing these products depend so much on their shelf life. Longer shelf-life fruits and vegetables are preferred for consumption as events such as early morning rush and evening rush for fruits and vegetable consumers respectively are time consuming and stressful.

Romeo-Arroyo et al., (2020) looking at the consumption patterns during lockdowns like the one done as a result of the COVID-19 pandemic. They discover that during these times, consumers' decision on the shelf life of the products , they needed became more manifest showing that buyers preferred products they intend to use later to be more processed and with long shelf life. This movement was observed in all the food categories meaning that people changed their purchases modus operandi to only make frequent visits to the grocery store at most.

Looking at the several business sectors that have been discussed in George and George (2023) on the influence of AI technologies such as ChatGPT, one is able to see that the food industry has been among the most affected. On the considerations such as shelf life, the authors posit that AI can help assist the consumers in making informed decisions as well as offering them advice. The following way this technology can improve consumer trust in products with a long shelf life chiefly within the segment concerned with technological advancement and the visibility of information.

Consumer behaviors discussed by Sánchez-Bravo et al. (2020) reveal that sustainable customers tend to buy the products with long shelf life to avoid food waste. This predilection is even more

noted in the packaged and processed foods, because shelf life is one of the most essential factors influencing buying decisions in those categories.

In their study Guiné et al. (2020) pointed out that with the increased self-life, innovation in food products gains success among the conscious health and convenience-seeking consumers. These segments thus appreciate products that satisfy the two aspects of durability and quality hence fueling the need for preservation of food.

De Corato (2020) has pointed out that the expectations that consumers have living fresh produce are considerably defined by shelf life. In highly urbanized markets, where customers are likely to be time-constrained and therefore, not very patient with their produce, commodities with longer shelf life, such as fresh fruits and vegetables are often demanded.

In the case of the pandemic confinement periods, Romeo-Arroyo et al., (2020) found that consumers prefer products to have a longer shelf life. This behavior is quite observable in the different food compartments given the aim to reduce the shopping trips and guarantee available food supply.

According to George and George (2023), through innovations such as ChatGPT, consumers can easily get correct information on shelf-life reducing anxieties. Targeting the information-oriented consumers who are actively using technologies and are searching for any product in an open and clear fashion. Sánchez-Bravo et al. (2020) also state that own-consumer's shelf-life is considered as sustainable factors for the sustainable consumers in the packaged and processed food products. More shelf life leads to less spoilage and belongs to their concept of environmental concerns. Guiné et al. (2020) affirm that there is a need to develop innovations in food preservation to suit the health conscious and convenience consumers. Of these attributes, long shelf life without a decline in product quality is essential to these market segments.

De Corato (2020) emphasized the need for long-life fresh produce to suffice the urban consumers who prefer shopper convenience of consumer needed longevity. This demographic needs fresh fruits and vegetables that take a relatively long time before they deteriorate. In their study conducted on Mexican consumers, Romeo-Arroyo, et al., (2020) establish that average importance of shelf life rises significantly during confined moments involving all the food segments. This shift same can be hailed as a new general societal trend towards mass

procurement and hoarding during periods of volatility. According to George and George (2023) it is advisable to incorporate solutions that enhance the use of artificial intelligence to deal with consumers' sensitivity to the shelf life of products. The dissemination of timely and appropriate information can be useful in improving consumer trust and stimulating sales in spheres that are focused on advanced technologies and openness.

This aspect of the analysis gives a broad description of customer relations to the shelf life in the marketplace with an especial focus towards such topics as sustainability, convenience, and technology in relation to shelf-life in different markets. I believe that the greatest asset of this discussion is mainly based on the proper analysis of how various consumer groups ranging from the groups of health-conscious consumer's working consumer's consumer umbrella, and sustainability-conscious consumers consider shelf life when making their purchasing decisions. However, there is a potential weakness in this research stream in that while several consumer attitudes have been identified, there is often a lack of direct link to practical business solutions defining practical changes food producers and retailers can make, especially by adopting technologies such as AI to improve consumers' trust in products' shelf life. Furthermore, and even though the proposed approach is highly successful in pointing to the role of shelf life during specific circumstances, such as the COVID-19 pandemic, the study could use a more detailed discussion of how such trends can be expected to perpetuate or change in a post-COVID-19 world. All things considered, this aspect is well-developed but has the potential to be solidified even more than with the inclusion of industry consideration and foresighting of trends concerning the self-life of products.

1.7 Theoretical Models on Shelf Life and Perceived Risk

Arfi et al. (2021) have used the Unified Theory of Acceptance and Use of Technology (UTAUT), perceived risk and financial cost to examine the acceptance of eHealthcare among the IoT generation and the migrants from the traditional world. Their model also shows that perceived risk has a direct significant influence towards the acceptance of technology. In the specific case of the shelf life, by linking the perceived risk factors to the consumers' acceptance and purchase behaviour when new preservation technologies are disseminated this model can be applied.

Wu et al., (2020) presents a study done on the analysis of impulse buying behavior on the internet where perceived risk, expectation-confirmation theory, and flow theory were used. Based on the research that they conducted they establish the fact that the perceived risk has an influence on the impulse buying. Incorporated within this context, this theoretical framework may be used to consider the perceived risks associated with the shelf life of food products, and the triggering of impulse buying behavior; thus stressing the significance of managing shelf life information to alleviate consumer indecision.

Subsequently, through Protection Motivation Theory (PMT), Rather (2021) assesses the impact of perceived risk and fear on customers' engagement and co-creation, as well as revisit intention amid the COVID-19 breakout. This paper has shown that perceived risk and fear have great impact on the consumer behavior. Transposing PMT on shelf life allows for prediction of how perceived threats with regards to food safety and shelf life influence protective behaviors such as rejection of certain products and or search for products with longer shelf life. Using a model with uncertainty, perceived severity, perceived sparsity, and anxiety, Omar et al. (2021) look at the determinants of panic buying in the course of the COVID-19 outbreak. According to their study, these are some of the aspects that cause panic buying, among consumers. It can be used in explaining why consumers develop views of the short shelf life food products and other risks that are likely to lead to panic buying hence the importance of destigmatising shelf life communication.

To understand the antecedents and consequences of perceived shopping value by smart retail technology, Adapa et al., (2020) carried out a research. Their model also shows how perceived risk influences perceived value & shopping sites' patronage. When it comes to shelf-life, this framework may be used to examine how consumers' perceived risks about the sustainability or safety of food products affect perceived value which in turn affects consumer satisfaction and purchase intentions.

In their study, Arfi et al. (2021) also stress on the fact that perceived risk is one of the most important constructs concerning technology acceptance and, thus, can also be applied to food preservation technologies acceptance. Identifying an analysis of perceived risk in relation toward shelf life can help in promoting better consumer response and trust towards novel preservation techniques.

Wu, et al., (2020) classify perceived risk as having an impact on impulse buying through an online marketplace. Since perceived risks include the shelf-life of products, elimination of this cue allows the retailers to enhance impulse buying of food products.

According to Rather (2021), perceived risk as well as fear are responsible for the protective actions. Such protective behaviors within the context of food shelf-life involves avoiding foods that are associated with high risks such as short shelf-life stressing the importance of methods to counter these risks. Other scholars like Omar et al. (2021) explain that certain aspects predict stock-up psychology, for example, perceived shortness and danger. Focusing on the perceived risks and associated with short shelf life, it is possible to minimize the likelihood of people's panic buying during crisis.

Adapa et al. (2020) prove that perceived risk plays an effect on perceived shopping value. Thus, making the information about shelf life clear and accurate contributes to the formation of increased perceived value of food products that results in the improved satisfaction with shopping. According to Arfi et al. (2021), perceived risk is an effective addition to models of technology acceptance, as it gives a clear picture of the consumer. This concept is applicable to food products because perceived risk concerning the shelf life might impact consumers' acceptance and willingness to buy the product.

Wu, et al., (2020) state that it is possible to get positive effects for impulse buying when managing perceived risk. For the food category, this study established that transmitting accurate and easy-to-understand information regarding shelf life diminishes consumers' hesitation and enhances impulsive purchases. According to Rather (2021), perceived risks and fear must be tackled with the aim of positively altering consumers' behaviour. In the food industry, it was concluded that having shorter time frames contributed to customers' concerns and, hence, the efforts to manage such concerns could increase customer interest and subsequent patronage.

According to Omar et al. (2021) suggestions exist for combating factors that cause panic buying. Promising facts about shelf life help to remove barriers related to product shortages and eliminate the phenomena of panic purchasing during the crisis. The current social perception conceptualised by Adapa et al. (2020) is informing consumers, that perceived risk has to be managed with the aim of increasing perceived shopping value. In the context of foods, it will be seen that proper labelling of shelf life will enhance perceived value and consumers' satisfaction.

Through this aspect of the analysis, the use of different theoretical models in explaining the cell 'Shelf life and perceived risk' is well elaborated in detail, thus illustrating how the models can be used to analyze consumer behavior and decision making processes. The strength is in its based review of models as the Unified Theory of Acceptance and Use of Technology (UTAUT), Protection Motivation Theory (PMT), and expectation-confirmation theory that clearly outlines perceived risks relating to shelf life impacting acceptance, impulse buying and panicked buying during crises. However, there may be a gap on fit and specific synthesis of these theoretical frameworks into one that can provide a better conceptual map on how these theoretical gains can be deployed towards improving consumers' trust and perceived risks in the food industry. Moreover, although the evaluation sufficiently examines the consequences of perceived risks for consumers' decisions, here it is possible to pay more emphasis onto how it is possible to apply the mentioned models for the enhancement of the strategies of communicating and labelling back to consumers in order to minimize such risks and enhance consumer confidence. In general, this aspect offers a great theoretical support but there is a need to link the models more effectively and provide more concrete recommendations concerning the action strategies for various stakeholders from the industry.

Protection Motivation Theory (PMT) was conceptualized by Rogers (1975) and is one of the highly researched psychological theories used to understand the protective behaviourthat is performed when an individual perceives a threat. The theory is based on two key cognitive processes: Getting back to the framework, we will focus on two types of appraisal, namely threat appraisal and coping appraisal. Threat appraisal is defined as the assessment of threat, for example, the safety or the shelf life of foods, whereas coping appraisal is the ability within an individual to manage the threats such as purchasing foods with longer shelf life, or following directions on how to preserve the shelf life of a product (Rogers, 1975). PMT has therefore been used extensively in consumer behaviour studies, especially to study the consumer response to risk related to usage of foods and other consumable products, such as perceived risk of food spoilage and food contamination risk (Rogers & Prentice-Dunn, 1997). This makes it an ideal theoretical premise on which this work will focus on the effects of shelf life and perceived risks on consumer purchasing intentions.

With special reference to food consumption behaviorally, PMT asserts that consumer decides not to purchase particular products due to presumed risks associated with them such as short shelf life or likelihood of spoilage. Consumers choice regarding buying food products has been described in several studies in terms of perceived severity and likelihood of risks. For example, as early as 2022, NielsenIQ observed that the ability of consumers to penetrate the online store a fair deal of anxiety about the safety of food and its shelf life particularly during the COVID 19 pandemic. These results mean that consumers will offer protective behaviors as in avoiding foods that are azerbiez or choosing products that have dates of expiring when they have high perceived risks. Concisely, this protective response resonates with the fundamental concept of PMT since people are willing to change their purchasing behaviours in order to reduce potential health hazards, this makes PMT highly applicable to food industry context.

Furthermore, PMT is most valuable when analysing the increasing consumer demand for foodstuffs that have associated attributes such as safety, sustainability and durability. Chen et al. (2022) have established that when consumers are offered the shelf life information they feel capable of making decision hence eradicating what they refer to as perceived risks. For instance, informative labels regarding shelf life of any food item, storage condition and safety measures do away with consumer's fear of food spoilage. This decrease in perceived risks enhances the consumers' incentive to buy the product, thus linking PMT to consumers' buying decision. By using this method, both the shelf life and risk information communicated would be assessed to provide the picture of the effects on consumers' trust and purchase decisions for foods.

1.8 Methods to Evaluate the Influence of Shelf Life and Perceived Risk on Purchase Intentions

Phamthi, et al., (2024) have given a systematic review on the role of risk perception towards the buying behaviors of the consumers in e-biz. They stress on the survey and structural equation modeling (SEM) to understand how various dimensions of perceived risks influence the consumers' responses. This method can be altered to assess how shelf life information influences perceived risk and purchasing behaviours for food items; such an approach offers a sound framework for studying consumers' decision-making.

Expanding on the need to understand the impact of perceived risks on the multiple components of the purchase intention, Nguyen et al. (2021) focus on the COVID-19 online food purchasing situation in Vietnam. Using questionnaires and a logistic technique of regression analysis, they establish major factors that influence purchase intentions. This approach can be applied in evaluations on perceived risk due to shelf life information and its effect on purchase decision while adopting online grocery shopping.

In the study by Juliana et al. (2020), the concepts under consideration are green perceived risk, green viral communication, and green perceived value concerning green purchase intention. These relationships are explored by a method of factor analysis and path analysis and so on. These methods can be easily modified to explore the relationship between perceived risk of shelf life incorporated in food products being analyzed and the likelihood of purchasing such products, especially those that can be categorized as 'ecological'.

Perceived risk is investigated by Zhang and Yu (2020) in the context of cross-platform buying in the course of cross-sectional surveys and cross tabulation. Accordingly, their findings stress the need for comprehending how the perceived risk differs across the channels. This study can be employed to compare the perceived risk and purchase intentions affected by shelf life information in different formats of food retailing channels, both online and offline.

Narayanan et al. (2022) look into the most important antecedents of cargo cycle purchase intention and actual purchase through mixed method of survey, interviews and discrete choice modeling. In this respect, their approach gives a good grasp of the phenomena underlying the consumers' behaviour. For purpose of the sample setup, this evaluation framework can be utilized along with both the quantitative and the qualitative results to determine the effect of perceived shelf life and perceived risk on the intended purchase circumventing an integrated modal.

Consequently, Phamthi, et al., (2024) recommend applying the structural equation modeling (SEM) for the assessment of the effect of perceived risk on the purchase intentions. This research shows how SEM can be used to manage shelf life and food products by being used to identify various factors that exist between shelf life information, perceived risk and buyers' buying behaviour.

According to Nguyen et al. (2021), the study on risk factors concerning food purchase intentions involves the application of the logistic regression analysis. This method can be used to explain the effect or perceived risk on consumers' decision making concerning the shelf life information where certain aspects of the shelf life information like the expiry date and conditions of storage are taken into consideration.

Accordingly, in the studies of perceived risks, perceived values and purchase intentions, factor analysis and path analysis suggested by Juliana, Djakasaputra, and Pramono (2020) are useful. These methods can be implemented to discover how shelf life affects the perceived risk and thus the purchase intentions with a special attention to sustainability oriented individuals.

Zhang & Yu (2020) establish how the process of cross-tabulation analysis enhances the knowledge on buyers' cross-platform buying behaviour influenced by perceived risk. This method can be used to compare the effectiveness of shelf life information for purchase intentions based on which type of food distribution platform provides the most insights into the consumer's behavior that are associated with the specific type of platform.

Accordingly, Narayanan et al. (2022) stress the need for collecting and analysing both quantitative and qualitative data, as well as discrete choice modelling to predict consumer's purchase intentions and their actual behaviour. The methodology proposed by Li et al (2015) provides a cross-sectional method to systematically examine the organizational effects of shelf life and perceived risk on the food purchasing decisions which can be of both quantitative and qualitative nature. As stated by Phamthi, et al., (2024), analysis carried with the help of SEM enabled proving that this model is indeed a powerful instrument for the assessment of multiple links between perceived risk and purchase intentions. Specifically for food products it can help explain how shelf life information affects perceived risk and purchase intention, which then can be beneficial to marketing practitioners.

Based on the findings of Nguyen et al. (2021), the use of logistic regression analysis would help in establishing a relation between the factors influencing purchase intentions. It can assist in identifying particular shelf-life attributes that are most likely to increase perceived risk and therefore influence shoppers not to make a purchase, which will assist in the enhancement of labeling and information provision aspects. According to Juliana, et al., (2020), it is possible to use factor analysis and path analysis to get insights into perceived risks influences the purchase

intentions through perceived value. These methods can show how the shelf-life perceptions can affect perceived value of food products and consequently the purchase intentions.

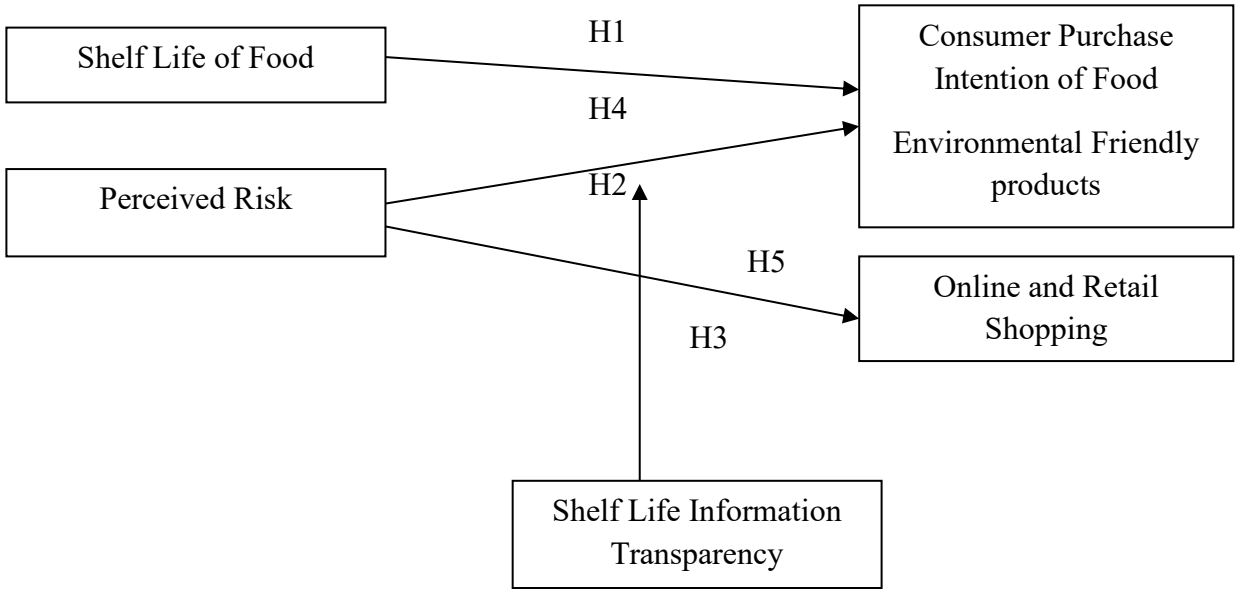
Zhang and Yu (2020) considered that, using cross-tabulation analysis can help to identify the differences of the perceived risk impacts across different platforms. With this method, it would be possible to determine how shelf life information contributes to purchase intentions in physical and virtual stores. Narayanan et al. (2022) also support a multimethod approach towards consumer research to obtain a broad understanding of the phenomenon being studied. By integrating the quantitative data from the initial survey with post-hoc qualitative interviews and discrete choice models, there is an opportunity to gain a more wellness depth of detail about the ways in which both shelf life and perceived risk figures into consumers' food purchasing decisions.

This aspect of the analysis presents a pertinent and comprehensive look at different ways by which the effect of shelf life and perceived risk on purchase intention can be assessed, including several numeric and/or alphabetic approaches. Its strength can be attributed to the methodological richness involved in the focus areas such as the structural equation modeling (SEM), logistic regression analysis, factor analysis and the cross-tabulation analysis to offer a comprehensive perspective of how shelf life information and perceived risks influence the behavioral intention of consumers. However, one could think of a potential gap in this line of research that involves offering a more systematic link between these methodological developments and their actual use for formulating prescriptions for businesses in the ways they can use these techniques to enhance the communicative features of their advertising and their labeling of products. Moreover, it has been found that despite the fact that the analysis provides a comprehensive cover of the theoretical and practical application of these methods, it lacks sufficient depth in looking at how one may build up on the other or how one may be modified to fit the changing nature of the problems in consumer behavior, especially in the food retailing business that is advanced by online and offline food retailing services. On the whole, this aspect is rather balanced, yet more attention could be paid to the pragmatics of such approaches as well as their applicability for various actors in the food industry.

2.0 METHODOLOGY

In this chapter, the overall research design, as well as the specific approaches employed for data collection and analysis in the context of the research questions pertaining to the influence of shelf life and perceived risks on overall consumer purchase intentions in the food industry are described. It provides understanding about the quantitative method of study, methodological sampling and techniques used to promote the credibility and dependability of the study.

Figure 1: Theoretical Framework of the Study



2.1 Hypothesis

H1: Shelf life positively influences consumer purchase intention for food products.

The findings also revealed that shelf life is highly influencing consumer buying decisions because it covers the issue of the product's durability, quality, and safety. Longer shelf life usually gives consumers the benefit of using products for a long time hence they use frequent purchase items less and wastage is reduced (Demartini et al., 2019). For instance, shelf-life extensions in packaged fresh fish fillets has been revealed to enhance consumer acceptance in cases where such extension is clearly conveyed (Demartini et al., 2019). Longer shelf life is considered by the consumers as an indicator of better quality and preservation of the products, specially the perishable products like frozen beef; it highly influencing the purchase decision of consumers (Hati et al., 2021). Zhao et al., (2017) has echoed the same point mention that where Shirky's physical cues of freshness such as, 'products' shelf-life' are unobtainable due to the lack

of face-to-face settings, particularly in online retailing then transparent and readable ‘products’ shelf-life’ details are even more vital in enhancing consumer confidence and therefore, consumer switched Web generation has rely on these cues in their evaluation of the authenticity Additionally, consumers more often find shelf-life data for products that meet sustainability objectives and link longer shelf lives to using fewer resources and having less of a negative environmental impact (Huang &Talpur, 2023). I also found out that another area that consumers are keen on regarding shelf-life communication is contributing towards improving perceptions of the product due to absence of fears that the product will go bad or that its quality has been compromised (Demartini et al., 2019). Consequently, information on shelf-life extends into a competitive weapon for placing products as secure, superior, and buyer-favourable (Huang &Talpur, 2023).

H2: Perceived risks negatively affect consumer purchase intention for food products.

Perceived risks include issues to do with the quality of the product, safety, genuineness of products and service delivery channels which have a massive impact on consumers’ buying decisions. In online food delivery services, these risks are somewhat higher due to the absence of tangible product that can be touched and felt by the supplier and the transportation provider, primarily freshness (Pillai et al., 2022). Another type of risk, namely financial risk which includes overpayment and perceived risk of product quality, also push consumers away from purchase commitment (Pillai et al., 2022). Schemes that are associated with green washing entail making of false or even inflated claims of sustainable products and suck the consumers confidence and their ability to purchase new products due to skepticism (Tarabieh, 2021). In cross curtain communications peoples perceptions of risks associated with quality and safety of products bought online affects the ability of firms to expand over larger audience (Rosillo-Díaz et al., 2020). Consumers pay a lot of attention to the perished food products concerning risk about spoilage and contamination which makes risk management measures significant to influence the purchasing intentions (Wang et al., 2020). Honest Labelling, Certification and Quality Assurance play central role in attenuating perceived risk and enhancing consumer confidence (Wang et al., 2020). As these risks are not well managed, firms are still struggling to lock-in consumers and generate loyalty especially in keen and modern sectors (Rosillo-Díaz et al., 2020).

H3: Shelf-life information moderates the relationship between perceived risks and purchase intention.

Enhance perceived risk reduction And positive consumer purchase intentions could be made when a conspicuous and easily comprehensible shelf-life label is provided. Ironing out the overall shelf time of foods ease people's minds on issues of product viability, quality, and flavor stability, a factor that could be very crucial in foods that are already cooked and packaged for immediate consumption (Zheng et al., 2024). Consumers who come across clear labeling will be convince that the product is trustworthy and safe hence buying more of the product (Nardi et al., 2020). Li et al. (2024) points out that when the consumers depends on descriptions, representations and demonstrations about shelf-life and the processes that leading to the production of various products constitute key factors whereby doubts are eliminated and confidence is prominently displayed in cases where the consumers are buying products via the online retail platform. Additional functionalities of active packaging technologies such as relaying on-shelf information increases consumer's trust in the product's quality and reliability, which translate into business competitiveness (Dabija et al., 2024). The steps toward increased transparency regarding shelf life contribute to consumers' trust due to the treatment of important issues as spoilage, safety and getting of the best value for the money we spend (Zheng et al., 2024). Hence moderating the perceived risk and purchase intentions online, the accurate shelf life information helps to achieve the gap between customer expectation and the firm's offerings as stated by Nardi et al., (2020). This transparency not only minimises consumer skepticism but also enhances the overall corporate image of the brand in the cut throat markets (Dabija et al., 2024).

H4: The shelf life of food has an influence on environmental friendly products.

Analysing the consumers' behaviour that has shown more awareness of sustainability, they have given 'shelf life' as a critical factor reflecting or affecting sustainability. As a result of minimizing food waste and optimizing the utilization of resources, longer shelf lives are in great demand in environmentally friendly markets (Balevičiūtė, 2021). Products with longer shelf lives are viewed as more sustainable because they would better match cultural norms ppl today have toward trying to do the right thing and preserving resources and costs (Oliver et al., 2023). Sustainability packaging that maintains the efficacy and durability of goods, beautifies these products thereby making a range of them attractive to conscious consumers (Da Rocha, 2021).

That is why the marketing communication of sustainable products with the features of a long shelf life increases its attractiveness even more (Chang & Su, 2022). For instance, it was found that the issues related to the environment, including the packaging of the product and the clarity of the shelf life of the product, are instrumental to consumer retention (Oliver et al., 2023). They highlighted that by considering sustainability and durability of goods, consumer needs are met and, therefore, organizational products could be considered as luxury products in the market (Balevičiūtė, 2021). Clarity of these attributes increases consumer trust and the perceived usefulness of the product leading to purchase intentions (Da Rocha, 2021).

H5: The negative effect of perceived risks on purchase intention is amplified in online shopping compared to traditional retail settings.

Perceived risks are especially overemphasized when the general population carries out shopping online and is not in a position to physically touch the products being sold in the markets (Matilla&Karjaluoto, 2005; ArrudaFilho et al., 2020). Risk factors related to delivery problems, product-item inappositeness, and the truthfulness of descriptive notes add to these risks, and therefore, consumers are slow in purchasing perishable goods from online stores (Shao et al., 2021). Other negative experiences which make the consumers have low trust and confidence in the e-business platforms include; getting the wrong products that are different from those advertised online (Chung et al., 2022). Product descriptions which can often be misleading or incomplete instead of being read as body language signals accompany sensory information exclusion creating added vulnerability (Zhu et al., 2023). This lack of transparency increases perceived risks and has a negative influence on the purchase intention especially for relatively perishable products (ArrudaFilho et al., 2020). In light of these issues, businesses need to enhance communication on product quality, freshness and delivery to minimize consumers' suspicious (Shao et al., 2021). Through enhancing transparency and quality assurance, the negative perception of risks can be reduced, and consumers are willing to shop online controlling for the factors that make risks worse (Chung et al., 2022).

2.2. Data Collection and Research Instruments

In line with the guidelines of the previous studies including Demartini et al. (2019) & Pillai et al. (2022), this study uses an online self-designed questionnaire as a primary data collection instrument to measure the relationship between perceived shelf-life and perceived risk with the

consumer buying behaviours. Data collection focused on both net and traditional active food shoppers which are likely to universally cross-represented for the target unified shoppers with prior experience in buying perishable food products. Electronic self-administered questionnaires were used on a sample of convenience which was recruited to participants without regard to age, gender, education, or shopping preferences. The completed questionnaire sought the subject's perception on shelf life, perceived risk and buying intention.

Scales used in prior research were adopted to served the purposes of inter-study scalability, reliability as well as validity. These include:

1. Shelf Life Perception Scale: This scale is used to assess consumers' awareness and perceptions of shelf life in line with the existing studies of Demartini et al. (2019) and Hati et al. (2021) The items used in this scale are, The items cover aspects of the importance of shelf life, comprehensibility of shelf life and the degree to which shelf life affects consumers' trust and purchase behaviour. The scale has high reliability in measuring the construct with Cronbach's alpha coefficient of the scale, varied between 0.75 to 0.85.

2. Perceived Risk Scale: Based on Cunningham (1967) and Pillai et al. (2022), these following aspects of the scale are used: financial risks, delivery risks, safety risks, which are considered in on and off-line food shopping. Cronbach's alpha for this scale ranges above 0.80.

3. Purchase Intention Scale: According to Dodds et al. (1991), this scale measures perceived risk for food products with shelf life as the-item, with Cronbach alpha estimates ranging between 0.80 and 0.92 in prior studies.

The demographic questions have been incorporated in the questionnaire while the ratio scale items are used to measure the constructs that have been hypothesized in this study. The respondents in the pilot study comprised 30 participants to guarantee wording and instrument reliability.

2.3 Sampling and Size of the Population

In this case, the target population is defined as the active clients of food products who either buy their groceries online or from stores. Recruitment was done purposively, in the sense that we used non-probability, convenience samples to capture a wide range of responses. The screening criteria stipulated that participants should be those who had previously purchased perishable food stuffs and those, who were aware of shelf life labels as shown in the Table . Based on step 5 of the methodological approach, the sample of this study is proposed at 405 respondents; following previous studies empirical literature recommendation (Zheng et al., 2023; Tahir, 2023) enough statistical significance power was chosen. Sample size is consistent with previous findings and it also has ±5% at 95% level of significance.

Table 1: Sampling Measurements

No.	Author	Type of Questionnaire	Sampling Technique	No. of Respondents
1	Tahir (2023)	Face-to-face survey	Random Sampling	423
2	Zheng et al. (2023)	Online Questionnaire	Convenience Sampling	433
3	Jang (2022)	Manual Survey	Random Sampling	240
4	Rani and Toni (2022)	Online Survey	Not Identified	574
5	Stefan et al. (2013)	Online Survey	Not Identified	268
6	Stancu et al. (2016)	Web-based survey	Random Sampling	1,062
7	Belfakira et al. (2024)	Face-to-face and Online Survey	Not Identified	442
8	Sokolova and Kafi (2022)	Online Survey	Random Sampling	209

Total				**405**

This sample size is enough for achieving both reliable and externally valid understanding of how shelf life, perceivd risks affect the consumers' decision to purchase.

2.4 Chapter Summary

In this study an exploratory quantitative research methodology was employed whereby data was collected from 390 respondents by means of self-administered structured questionnaires. It is for this reason that purposive sampling was employed with an emphasis on demographic variety. Shelf life perception, risk perceptions, and purchase behaviors were evaluated by structured validated scales; reliability test employed Cronbach Alpha. Key relationships were tested using descriptive statistics, correlation coefficients, regression analysis, and Hayes' moderation analysis. The ethical issue such as consent and data privacy were upheld. The research approach guarantees sound evidence on consumer behavior and sound strategy advice for companies.

3. RESULTS AND DISCUSSION

This chapter outlines the research results drawn from the analysis of collected data that responds to the research objectives and hypotheses pertaining to the shelf life/perceived risks/purchase intention stand of food products. It uses descriptive statistics, reliability testing, correlation and regression analysis, and moderation tests to examine the processes in consumer behavior characteristic of food shelf life and online shopping. The findings accentuate the importance of a product shelf-life in determining consumers' trust and purchase decision, and also analyse perceived risks as a variable to mediate. The conclusions derived from these studies offer a clear picture of the antecedent variables used in research, and gives implications of consumer decision making and managerial implications to the food industry.

Table 2: Descriptive Statistics of the Study

Descriotive Characteristics						
		Gender	Age	Education Level	Income Level	Primary Grocery Shopping Method
N	Valid	390	390	390	390	390
	Missing	0	0	0	0	0
Mean		1.4564	2.8846	2.8333	2.0000	2.2718
Std. Deviation		.49874	1.40675	1.44137	1.01657	.64770

The survey received 390 valid responses for all the variables measured with no cases of missing values. It consists of Gender, Age, Education level, Income level and the most important channel of grocery shopping. The Gender frequencies indicate that the distributions lean slightly towards one gender (most likely coded as 1] with low dispersion given an average deviation of 0.49874. For Age, the mean calculated was 2.8846 and standard deviation 1.40675, showing that sample has a moderate variation in the age indicating the presence of different age group. The Education Level indicates that our respondents are leaning more toward higher education as its mean is at 2.8333, however, it is a highly variable scale with a standard deviation of 1.44137. The Income Level has a mean of 2.0000, which confirms the respondents are moderately middle income

earners with moderate amount of standard deviation of 1.01657. Last but not the least, regarding the Primary Grocery Shopping Method where the subjects stated a mean of 2.2718 [$F(3.894) = 4.643$, $p < 0.05$], which reflects the subjects' preference on the second category in the coding scheme such as online shopping and relatively low standard deviation 0.64770. All in all, according to the surveys, diversity of demographic and behavioral features is seen in the dataset for the most part, although some variables are more homogeneous than others.

Table 3: Demographic Characteristics of the Sample (N=390)

Demographic	Percentage	Frequency
Gender		
Male	212	54.4
Female	178	45.6
Age		
18-24	87	22.3
25-34	83	21.3
35-44	74	19.0
45-54	80	20.5
55+	66	16.9
Education Level		
Higher school or equivalent	94	24.1
Vocational Training	91	23.3
Bachelors Degree	60	15.4
Masters Degree	76	19.5
Phd	69	17.7

Income Level		
Less than $2,000	146	37.4
$2,000–$4,999	153	39.2
$5,000–$7,999	36	9.2
$8,000 or above	55	14.1
Primary Grocery Shopping Method		
Online	43	11.0
In-store	198	50.8
Both	149	38.2
Total	390	100.0

The demographic purpose shows the distribution by the subjects in the given dataset. Regarding Gender, the sample depicted; 54.4% are males; the number of respondents being 212 while 45.6% are females; the number of respondents being 178. Age distribution also shows a relatively balanced and general distribution with 18-24 year category being the largest with 22.3% of employees followed by 25-34 with 21.3% , 45-54 with 20.5%, 35-44 with 19.0% and 55+ with 16.9%. In terms of Education Level, 24.1% of respondents completed higher school or the equivalent, while 23.3% had vocational education; 19.5% had a master's degree; 17.7% had a PhD; 15.4% had a bachelor's degree; which proves that all the respondents are rather educated. For Income Level, majority of respondents earn $2000-$4000 per month (39.2%); $1000 or below (37.4%); $8000 and Above (14.1%); and $5000-$7000 (9.2%). Primary Grocery Shopping Method On-line 11.0%, On-line and store 38.2%, Store 50.8%. In totality, the dataset encompasses coverage with regard to gender, age, education level, income level, and shopping habits of the population under consideration.

Table 4: Reliability Analysis of the Constructs

Scales	Cronbach's Alpha	No. of items
Shelf Life Perception Scale	.855	5
Perceived Risk Scale	.799	5
Purchase Intention Scale	.889	5

Based on the Cronbach's Alpha coefficients the study establish that all the three scales that are used in the study have high internal reliability. The Shelf Life Perception Scale got an alpha of 0.855, therefore the 5 items can be considered to be very reliable in assessing perceptions of shelf life. RELABILITY ANALYSIS The Perceived Risk Scale had an item total alpha of 0.799 thus suggesting acceptable reliability for the scale 's five items, these are; Perceived Product Risk. The highest reliability is in the Purchase Intention Scale of which 5 items are designed to measure the purchase intention of the consumer, and the alpha coefficient recorded was 0.889 indicating high internal consistency. These conformities endorse that all three scales have reliability for use in this study.

Table 5: Correlation among the Variables of the Study

Correlation among the Study		Awareness and Perception of Shelf Life	Perceived Risks	Purchase Intensions
Awareness and Perception of Shelf Life	Pearson Correlation	1	-.119*	.518**
	Sig. (2-tailed)		.019	.000
	N	390	390	390
Perceived Risks	Pearson Correlation	-.119*	1	-.130*
	Sig. (2-tailed)	.019		.010
	N	390	390	390

Purchase Intensions	Pearson Correlation	.518**	-.130*	1
	Sig. (2-tailed)	.000	.010	
	N	390	390	390

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The regression controls show that all the variables have a positive and significant relationship. The findings of Awareness and Perception of Shelf Life are significantly positively related to the Purchase Intention with moderate value (r equals to 0.518, $p < 0.01$). On the other hand, it has a negative, although very low, and insignificant relationship with Perceived Risks, with correlation coefficient of $r = -0.119$, $p < 0.05$. Perceived risks also have a very low negative relationship with purchase intention score =-0.130, sig < 0.05; that is, greater perceived risks slightly reduce the purchase intentions. In sum, these results underscore the importance of increasing awareness and reducing hazards for effective consumer purchase intentions promotion.

H1: Shelf life positively influences consumer purchase intention for food products.

Table 6: regression Analysis between Shelf Life and Consumer Purchase Intention

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.137	.685		14.795	.000
	Shelf life influences your trust in a product's quality.	2.354	.182	.549	12.947	.000

a. Dependent Variable: Purchase Intensions

From the regression analysis we can conclude that when trust as a result of shelf life is the independent variable that it has a relationship with purchase intentions. The model also identified a moderate positive correlation (r = 0.549), and where purchase intentions were concerned, 30.2% of its total variability was accounted for by the study. The ANOVA proves the significance of the model (F = 167,623; p < 0,001), which means that the predictor enhances the result significantly. Commitment is also positively related to purchase intentions at B = 0.309 with the connection being significant at p = 0.018. From these results, shelf life emerges as one of the most important antecedents of trust because it has a positive and significant impact on consumers' purchase intentions.

H2: Perceived risks negatively affect consumer purchase intention for food products.

Table 7: Regression analysis between Perceived risks and consumer purchase intention.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	20.840	.882		23.624	.000
	Perceived Risks	-.118	.046	-.130	-2.583	.010

a. Dependent Variable: Purchase Intentions

The outcome of the regression analysis work done further helps to validate the hypothesis (H2) which states that the perceived risks have a negative influence on the consumers' purchase intentions of food products. Accordingly, the academic findings reveal a low correlation between the variables, which can be observed in the studied model (R= 0, 130) as well as low coefficient of determination (R^2 = 0, 017). However, the directions of the coefficients suggest a significant and positive relationship (F = 6.673, p = 0.010). The unstandardized coefficient (B = - 0.118) reveals that generally as perceived risks increases by one, the purchase intentions decreases by 0.118 units; this is statistically significant at p = 0.010. These results support the hypothesis that perceived risks indeed have a negative and statistically significant effect on purchase intentions, but the effect is only small and therefore, one can hypothesize that other factors may impact consumer behavior more strongly.

H3: Transparency of shelf-life information moderates the relationship between perceived risks and purchase intention

Table 8: Moderation Analysis of the Study

Model Constant	*a coefficient*	*se*	t	p	LLCI	ULCI
constant	*14.8926*	*2.8554*	*5.2155*	.000	*9.278*	*20.5067*
PR	*-.2893*	*.1479*	*-1.9556*	*.0512*	*-.5802*	*.0016*
APS	*.2947*	*.1520*	*1.9387*	*.0533*	*-.0042*	*.5935*

Moderation analysis looks at whether the provision of accurate and clear shelf-life information act as a moderator between levels of risk perceived and consumers' intentions to purchase. The analysis of the overall model yields a F ratio of 49.444, which is significant at $p < 0.001$ level of significance and accounts for 27.76 per cent of the variations in purchase intentions as measured by R^2. Perceived risks were found to have a marginally non-significant negative impact on the purchase intentions (Coefficient estimate = -0.2893, p = 0.0512) while, shelf-life information was also found to have marginally non-significant positive impact of the purchase intentions (Coefficient estimate = 0.2947, p = 0.0533). Therefore, perceived risks and shelf-life information have insignificant association (B = 0.0127, p = 0.1131) for moderating perceived risks and purchase intentions. These results imply that perceived risks and shelf-life information are managerial net individual determinants for purchase intentions, while their cross-product does not constitute any significant combined impact whatsoever.

H4: The shelf life of Prodctshas an impact on Environmental Friendly Products.

Table 9: Regression Analysis between Shelf life of Food and Purchase intention of Environmental Friendly Products.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	20.984	1.022		20.530	.000
	Awareness and Perception of Shelf Life	-.135	.057	-.119	-2.360	.019
2	(Constant)	21.956	1.189		18.465	.000
	Awareness and Perception of Shelf Life	-.080	.067	-.071	-1.200	.231
	Purchase Intensions	-.103	.065	-.093	-1.590	.113

a. Dependent Variable: Perceived Risks

The regression analysis tests the hypothesis (H4) that the effect of shelf life on the purchase intention is more pronounced with sustainable or environmentally friendly products. Confirming hypothesis 1 in Model 1, awareness and perception of shelf life have small but significant effects on perceived risks ($R^2 = 0.014$, $F = 5.570$, $p = 0.019$); $B = -0.135$ $p = 0.019$. However, in Model 2, purchase intentions added as a predictor slightly enhance R^2 to 0.021 adding only shelf life is insignificant as its $B = -0.080$, $p = 0.231$ and likewise purchase intentions are insignificant as its $B = -0.103$, $p = 0.113$. This study indicates that as in other research, shelf life has a limited negative correlation with perceived risks, but does not play a significant role on consequently for sustainable product purchase intentions.

H5: The negative effect of perceived risks on purchase intention is enhanced in online shopping compared to traditional retail settings.

Table 10: Online Vs. Traditional Shopping Retails

Group Statistics

	Primary Grocery Shopping Method	N	Mean	Std. Deviation	Std. Error Mean
Perceived Risks	Online	89	18.9663	4.98053	.52794
	In-store	198	18.2071	5.41501	.38483
Purchase Intensions	Online	89	19.1348	3.38174	.35846
	In-store	198	17.6414	5.41644	.38493

Table 11: Independent Sample t-test between variables

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Perceived Risks	Equal variances assumed	3.460	.064	1.126	285	.261	.75922
	Equal variances not assumed			1.162	183.250	.247	.75922
Purchase Intensions	Equal variances assumed	51.670	.000	2.398	285	.017	1.49342
	Equal variances not assumed			2.839	255.940	.005	1.49342

The investigation seeks to find out whether perceived risked has a stronger negative impact on purchase intentions that had been observed in online shopping than in the traditional store environment. Indeed, the t-test analysis suggests that perceived risks of the online and in-store shoppers do not differ significantly ($t = 1.126$, $p = 0.261$), and the mean perceived risks levels

are relatively close (18.97 for the online and 18.21 for the in-store groups). However there is a significant difference in purchase intentions with t = 2.839, p = 0.005, with the mean score of online shoppers 1.493. These findings partially only support the hypothesis, as such amplification of perceived risks' negative effect is not visible in online environment. The results indicate that other factors might affect the shopping intention of online consumers even with perceived risks as to what they buy online appear to have higher purchase intention.

Table 12: Multiple Regression between Variables

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.742	1.151		9.330	.000
	Awareness and Perception of Shelf Life	.525	.045	.510	11.672	.000
	Perceived Risks	-.063	.040	-.069	-1.590	.113

a. Dependent Variable: Purchase Intensions

The outcome of the multiple regression analysis shows that the perception about Awareness, Shelf Life and Perceived Risks account for 27.3% of the variance for the Purchase Intention (R^2 = 0.273, F = 72,620 and p < 0.001) which is moderate and statistically significant. Whenever the Awareness and Perception of Shelf Life exist, the consumer purchase intentions are likely to improve significantly (B = 0.525, Beta = 0.510, p < 0.001). On the other hand, results indicate that Perceived Risks have a negative though weak relationship with purchase intention (B = -0.063, Beta = -0.069) though it was insignificant (p < 0.113). These results suggest that, although perceived risks do not play a significant role, increasing the perceived shelf life knowledge positively affects the purchase intentions.

4.2 Discussion

H1: These findings confirm the hypothesis that was developed for this research, as the correlation between shelf life and the likelihood of a purchase was positive and statistically meaningful ($r = 0.549$, $p < 0.001$). In the current research shelf life contributed 30.2% of the variance with the purchase intentions, thus highlighting its role in consumers' decisions. These studies share the same results with authors Zhang and Dong (2020), who noted that longer shelf life is regarded as a quality and sustainable value. Zhao et al. (2017) also agree with the argument that the adequate shelf-life labelling minimises uncertainty among consumers about the viability of the products. This research thus shows that shelf life influences perceptions towards product quality and at the same time, increases trust. For perishable food items, long products shelf-life means less food wastage and better value for the money as according to Heath and Vaughan (2012). The invented relationship can be of great benefit to the business organizations where emphasis was made on the extension of product shelf life and ensuring the consumer is informed of this through appeals which would lead to the intended increase in their purchase intentions.

H2: In support of the hypothesis, perceived risks are statistically negatively correlated with purchase intention albeit very weakly ($r = -0.130$, $p < 0.05$). However, the analysis of perceived risks shows that the explained variability of purchase intentions equals to 1.7%, though it is statistically significant. This is in line with Zhang and Yu (2020) who argued that perceived risk particularly the freshness and safety risks were definitive threats to consumers in online grocery shopping. Hence, the perceived risk is essential to be managed by firms concerning businesses and e-commerce specifically due to the lack of product touch-and-feel. That means measures like greater use of clear shelf-life communication, better delivery practices, and clear communication of safety measures could reduce such risks and boost consumer trust.

H3: The moderation analysis shows that shelf-life information does not significantly interact with perceived risks on the purchase intentions ($\beta = 0.0127$, $t = 1.281$; $p > 0.05$). By analyzing the \(\chi\)² values extracted from the sixteen hypothesized pathways of the structural model, it was possible to ascertain that while shelf-life information and perceived risks are confirmed antecedents of purchase intentions, their interaction does not contribute a significant combined

impact. This implies that information content of shelf-life and perceived risks balance independently of each other in influencing the consumer behavior. Our results support Zhao et al. (2017) who contended that although, shelf-life information deletes uncertainty, but it erases perceived risks' effects in their totality. Managers should treat these as two different facets to be improved selectively: better shelf life information, and parallel efforts to reduce perceived risks.

H4: The findings reveal only a small and not significant effect of shelf life on purchase intentions for sustainable products (B = -0.080, p = 0.231). Notably, perceived risks correlate significantly based on shelf life (B = -0.135, p = 0.019) but this is not the case when it comes to the purchase intentions of sustainable products. This is in disagreement with Zhang & Dong (2020) who observed that consumers have linked longer shelf life with sustainability and envronmental conservation. Regarding the disadvantages, one could presume that one of the reasons for the weak results is the increased customer sophistication in which sustainability is not only expressed in terms of product shelf life. For firms targeting more sustainable customers, issue of overall sustainability in the business beyond shelf-life, including green packaging and sourcing, will have to be embraced.

H5: As for the hypothesis of this paper, the latter is only partially supported. However, there is no found statistical difference between perceived risks of online and in-store shoppers (p = 0.261) but significantly higher purchase intentions noted among online shoppers (t = 2.839, p = 0.005). This implies that, there could be other factors other than perceived risks influences the purchase intentions in the online shopping despite the existence of risks.These results consolidate with Zhu et al. (2023) who pointed that compared to the traditional shopping, online shoppers consider the advantages and disadvantages of its process, which results in longer decision-making process. For businesses, attention should be paid to the actual perception of risks in the internet environment by using such measures as temperature control, labelling of shelf life or reviewing customers.

This present study supports the findings of previous studies concerning the reliability of shelf life in influencing consumers' buying decisions in the food industry. Being a sub-factor of fresh, shelf life critically dictates perceived product quality, safety and sustainability to the consumers. Heath & Vaughan, (2012) support these findings as it is widely understood that a longer shelf

life is considered to mean better product quality and durability. Such perception is well expressed for the perishable products such as fresh produce and meat because longer shelf life means less food spoilage and wastage will be the key concern of the customer in terms of value for money and impact on environment (Huang &Talpur, 2023).

Also, the study notes that there is a growing significance of shelf-life information as a feature in food packaging. Self admission about shelf life is advantageous as it reduces doubts concerning viability and safety of the products available. Purchasing decision confidence was significantly higher when consumers met labeled information of shelf-life and storage conditions according to the literature (Zhao et al., 2017). Operandi as such does not only eliminate perceived risks but also improves competitiveness of products, particularly in industries where reputation is the source of competitive advantage (Huang &Talpur, 2023).

The data further support the notio" that shelf-life information dissemination goes beyond quality assurance. They continue to be used as a sustainable marketing management tool. Items that have long lifespan and thus take less number of replacements are considered to be friendly to the environment. Given this link to sustainability, it resonates with such consumers, backed by research to argue that businesses must consider the shelf-life communication aspect regularly (Chang & Su, 2022).

When it comes to E-tailing, therefore, shelf life plays an even more significant function. The next type of information that is considered most important by consumers in their assessment of shelf-life status is information that cannot physically assess products. The lack of such details aggravates perceived risks especially freshness and safety which are key factors depressions to online buying. This proves that there is need to integrate a proper flow of shelf-life information and increase its visibility in e-commerce platforms' to increase consumer confidence thus influencing their purchase intentions.

Consequently, the shelf life of a product should be viewed not as a mere quality characteristic but as a complex component, which affects consumer credibility, their willingness to buy the product, and sustainability standings. Organization that are willing to extend the shelf life of their products and come up with proper shelf-life indicators will benefit a lot and have competitive

advantages. That too fulfills the customer expectations and needs of quality along with the overall trend toward sustainability and minimizing food waste. Future studies will thus seek to establish methods through which shelf-life communication can be modified in the future with an aim of enabling potential consumers minimize perceived risks and maximize on their trust.

CONCLUSIONS, SUGGESTIONSANDPRACTICALIMPLICATIONS

Conclusion

This research examined the extent to which shelf life and perceived risks affected consumers' purchasing decisions of food products where the Internet and conventional stores were of interest. The results validate the hypothesis that self-consumption is the most essential determinant that influences consumer trust as well as purchasing decisions, and has the greatest influence on perceptions of quality and safety. Higher shelf lives are preferred by consumers as an indication of superior product quality and sustainability which has been placed high on consumers' agenda. The above observations stress the fact that the shelf-life factors are key issues to be incorporated into business models for responding to customer anxieties and heralding enhanced market positioning.

Perrceived risk had a negative correlation with purchase intention and its effect was slightly smaller than that of shelf life. This implies that even though consumers are cautious of some risks that food products may possess, especially when engaging in online buying, they are so driven by the need to access comprehensive information of the products and including the shelf-life of the food product. These results underscore the need for businesses to adopt a two-pronged approach: by responding to perceived risks by increasing communication and removing uncertainties, as well as building trust by increasing shelf-life and promoting purchasing.

The study also points out the new trends that dominate the purchasing powers after covid, including health and safety, global environment, and time sensitivity. Due to concerns about sustainability every consumer is looking at product that has long shelf life while at the same time has prolonging the life of the environment. However, the study revealed that the interaction

effect of shelf life on the sustainability related purchase intention was not very high as postulated. This means that there is the need for managers of organisations to look for other ways by which they can adopt sustainable strategies other than issuing products with long life spans for instance use of ecologist packing and “green” sourcing to capture eco-conscious consumers.

One of the major conclusions drawn in the research is the importance of an accurate and clear provision of the shelf-life information as uncertainty-sreducing means of establishing trust. Shelf life labels are important for food quality and safety where often consumer has no option to inspect the products since the products were bought online. From the moderation analysis, it was revealed that providing exhaustive shelf-life information does not moderate the perceived risk and purchase intention relationship but is also a unique factor of consumer consideration. The concerns should be About how business can effectively address the concerns particularly in product labeling and challenging how shelf-life information can be presented to the consumers through packaging and potential advances such as digital labeling and real time shelf-life indication.

The results also shed light on the shifting of grocery buying online. Although cognitive risks including perceived risks related to the quality of products and possible contamination during delivery are greater in online contexts, ease of using internet shopping seems to overcome these perceived risks among consumers. Therefore, the present study indicates that business organisations must find the right balance between achieving convenience in the online shopping and reducing risks. Measures which could ensure the perceived risks.

There is also a demographic and behavioural indicator analysis of consumers regarding their purchase intentions. Also, demographic factors including age, education level and income of the customers revealed that group of young educated and higher income group are more interested in buying grocery online. The above finding supports the analysis of the market and recognizing specific segments that require targeted solutions. For instance, enterprises that are selling their products and services to the under 30s, tech-savvy customers will greatly benefit from more sophisticated e-shores’ architecture and device compatibility.

The results of this research can help to marketing and new product development In food industry. Another aspect that can be brought into focus for quantities that need to be sold is 'shelf life,' hence keeping products relevant to their consumers. In other cases, most of the perceived risks can be managed through correspondingly enhanced communication and safety measures to create trust and customer loyalty especially in a highly competitive environment. Sustainability also has to be incorporated in product development and marketing in order to fit the current customer demands for green products or services.

There are some limitations of this study with specific recommendations for future research, which are explains as follows: While shelf life and perceived risks were chosen as the major areas of interest, the influence of other factors like, brand reputation, price and perceived social pressure on intention to purchase were not investigated. Subsequent research may need to integrate the specifications of these studies with other variables for obtaining better insights of the consumers. However, there is an absence of understanding how emerging technologies like Artificial Intelligence and Blockchain could help to enhance consumers' perception and reduce risks in the online and traditional retail environment settings which were explored in the study. Researching about a number of such technologies and its applicability to the shelf-life and purchase behavior could be beneficial for some organization who are willing to invest in this area of technologies.

There is another shortcoming of the investigation: the use of self-constructed questionnaires may be influenced by social desirability and recall bias. To overcome this limitation, future research needs to use experimental/observational research to verify the results obtained. Secondly, the study was conducted only on a particular population and therefore its results cannot be generalize to other population. Cross cultural research could also assist inestablishing differences in consumption behaviour across cultures in order to have a better understanding how the global impacts shelf life, perceived risks and purchase intentions.

Consequently, this work emphasizes the importance of shelf life in the context of its academic implication in affecting consumer trust and decisions to purchase, while also noting that it is a potent business tool within the food industry. In the case of perceived risks, both increased communication and participants' safety are options available for addressing the risks the eight

models present. The results also highlight the role of sustainability and consumer-driven frameworks in modern organizations and their operation. It is believed that through applying these insights businesses would be able to increase competitiveness, create consumer trust and be a part of the solution towards improving food systems sustainability and efficiency. Consequently, the study offers a basis for future analysis of the multifaceted relationship between shelf life, personal risk perception and consumer behaviour in order to give impulses for the development of new approaches for market requirements.

Practical Implications of Study

These research outcomes present direct practical applications for firms in the food industry and food retailers businesses, which operate both online and offline market segments. Shelf life is revealed to be a major consumer purchase decision driver and, therefore, for businesses to stand the competition it becomes central for organizations to invest in new preservation technologies. Preservation of a food product also helps in creating a positive image for the products to the consumers besides helping in the fight against food wastage, supporting the sustainability agenda. Chilled food producers could for example engage in research to acquire better natural preservatives, better packaging and effective storage to meet consumers desire for longer shelf-life foods and also avert negative environmental impact.

The findings also assert that It is prudent to encourage suppliers to clearly detail the shelf-life of products and use this to generate consumer confidence. Manufacturers should therefore make a point of putting a label that will indicate the shelf life of the product as well as the conditions under which the product should be stored. This is more so for grocery and other commodities that can easily go bad, and products that buyers cannot touch or feel. Mobile applications with the help of which an ordinary customer can receive more detailed information about a specific product through a QR code placed on the package, as well as the software recommendations on shelf life, and where the product can be stored, will help increase transparency and gain consumer trust.

To online retailers, the study resumes on issues that users consider to be risky such as the freshness and safety of their foods during the delivery process. These risks can be explained by

the inability to regularly transport the vaccine in temperature-controlled vehicles and to ensure its secure packaging. Moreover, finesse appended to sections including freshness assurance policies and free and easy return policy also help in the enhancement of sale via online shops. Retailers could also use customer reviews and ratings, which do stress on positive experiences of superior product quality and delivery, as effective weapons, which may overcome the perceived risks.

This also implies that for any business to meet its consumers needs it has to make its advertisement and product different for the different age, income level and education level groups. Millennials and other younger people are in greater favor of online grocery shopping while the older population are more inclined to traditional store setups. It is also suggested that companies adapt their marketing strategies for e-commerce capabilities and web 2.0 technology for the younger generation segment while stressing on issues of product quality and customisation as vintage decades segment prefers coming to actual physical stores.

Appropriately, sustainability forms a distinct customer requirement specifically the green customer. Extended shelf life merits should be incorporated in the business sustainability concepts for product differentiation and marketing through environmental sustainability appeals such as the promotion of reduced food waste. For instance the packaging method of using biodegradable or recyclable material, using sustainable sources to obtain the raw materials, information on the social and environmental impacts can all help improve the brand image as far as green consumers are concerned. For products that a consumer then associates with sustainability, they not only meet a consumer need but also help a business gain a reputation of being socially responsible, an innovative company that is environmentally conscious.

It also points to the fact that businesses require consumers education as to how shelf life and safety influences product quality. Education and sensitization that ensue and prompt consumers of such foods on appropriate methods of storage, consequence of shelf life, relationship between shelf of food products and safety and value can influence the choice of consumers. It also makes such educational initiatives useful for decreasing misconceptions in perceived risks and increasing confidence in both product and brand.

From a competitioin point of view shelf-life innovations are a key selling point since consumers have many options in the market. Long shelf-life products particularly supported by clear information disclosure and sustainable production can achieve considerably more customers' appeal and even get higher prices. The inclusion of shelf-life improvements in value proposition activities allows firms to position themselves as quality and safety sensitive, or environmentally sustainable.

Therefore for online grocery, the study discovers that perceived risk could be dealt with through optimization of the customer experience. This includes availing simpler ROS Enlightenment, e-commerce platforms that have potential to offer product information, updated information on stock and food freshness, as well as simple, easy to follow navigation. In addition, the use of technologies which help to trace the supply chain such as blockchain due to the mistrust and constant emergence of counterfeit products in the market also increases Esopor's customers' trust when buying products over the internet.

More so, it offers recommendations which organisations can use to improve on their competitive front and portray a solution to dynamic consumer demands. Due to the relative influence that shelf life has on purchase behaviours, perceived measures of risk that may be offset through developing transparency and effective logistics, and the underlying tenets of sustainability that businesses can incorporate in their operations to increase consumer trust and switching cost. These functional policies serve to meet consumers' anticipated behaviour and help build a more efficient and viable food industry for the benefit of future business.

Limitations of Study

It should be admitted that this research has several limitations which, in turn, prevents its flawless execution. The work does have some limitations: one of the biggest concerns is the use of self-report data which could also be affected by factors such as social desirability bias and recall bias. Individuals may have overstated their perceived importance of shelf-life and sustainability related attributes or understated all other factors to purchase intention. Future studies could use experimental or observational procedures to explain facets of the results and reduce the possibility of the biases.

Another weakness is that the samples selected can have variety of demographic characteristics, but are selected based on one geographical or cultural area. Consumer behavior related to matters of shelf life and perceived risks, as well as purchase intentions may therefore differ considerably from region to region because of factors such as cultural beliefs, economic environments, and market features. Therefore, it is recommended that the variations observed in study should be investigated across cultural differences and to increase the external validity of the study.

The necessity Is very important because the study also limits the factors that may influence purchase intentions mostly to perceived risks and shelf life of the product. These factors like brand image, perceived characteristics of product, perceived social norms can indeed contribute a major portion in consumer behaviour. The use of these additional variables in future studies might have given a better picture of the decision making process in the food market.

Despite the contributions made by the study in explaining consumer perceptions in online and traditional retail environments, the work does not offer any information regarding the use of novel technologies in shelf-life and perceived risk concerns. All these technologies hold possible solutions to the need of improving how organizations handle and relay information on quality and safety of products. Future studies should also examine how qualitive innovations can reduce risk and improve trust from the customers.

Also, using perceived risks and purchase intentions as the dependent variables, the study tests the moderation effects of clear shelf-life information, but yields marginal significance only. This is may be because of restricted nature of data collected or presence of other external variables that are not accounted for. Successor research can build upon this examination by applying a more extensive dataset and adding new moderation variables, for instance, product types or the customers' degree of brand awareness.

Finally, the period under review may have affected the findings since people's behavior is in most cases dictated by factors such as the economy, a pandemic or outbreak, or disasters. Use of longitudinal designs would aid in observing changes within results in consumer behavior after a specific period thus giving a dynamic glance on relations analyzed in this research.

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