

**Publisher**<http://jssidoi.org/esc/home>


---

**DIGITAL TRANSFORMATION IN FOOD RETAIL: A CASE STUDY OF LITHUANIA E-GROCERY BUYING BEHAVIOURS\***
**Valentas Gruzauskas<sup>1</sup>, Aurelija Burinskiene<sup>2</sup>, Artur Airapetian<sup>3</sup>**
<sup>1</sup>*Department of Business Technologies and Entrepreneurship, Vilnius Gediminas Technical University, Saulėtekio al. 11, LT-10223 Vilnius, Lithuania*
<sup>2</sup>*Business Management Faculty, Vilnius Gediminas Technical University, Saulėtekio al. 11, LT-10223 Vilnius, Lithuania*
<sup>3</sup>*Vilnius University Faculty of Medicine, Vilnius University, M.K. Ciurlionio 21, LT-03101 Vilnius, Lithuania*
*E-mails: <sup>1</sup>[valentas.gruzauskas@vilniustech.lt](mailto:valentas.gruzauskas@vilniustech.lt); <sup>2</sup>[aurelija.burinskiene@vilniustech.lt](mailto:aurelija.burinskiene@vilniustech.lt); <sup>3</sup>[artur.airapetian@mf.stud.vu.lt](mailto:artur.airapetian@mf.stud.vu.lt)*
*Received 15 November 2023; accepted 22 January 2023; published 30 March 2024*

**Abstract.** This study addresses the evolving landscape of food consumption in the context of digital transformation, focusing on how online platforms are reshaping grocery shopping preferences and perceptions towards local and temperature-controlled foods. Amidst the proliferation of e-grocery services and changing dietary trends, a critical need exists to understand these shifts for informed public health policy and e-commerce strategies. Our comprehensive survey investigates the growing inclination towards e-grocery shopping, including preferences for delivery times, responses to delivery delays, and the importance of perishable item shelf life. The study further assesses consumer attitudes towards local food sourcing and the role of e-groceries in promoting dietary diversity and health-conscious choices. Additionally, it probes into concerns over food safety and quality assurance in temperature-controlled foods purchased online. The findings reveal significant insights into contemporary eating behaviours and e-grocery adoption, offering crucial implications for public health interventions and the advancement of digital grocery platforms.

**Keywords:** E-grocery; food industry; supply chain management; buying behaviour

**Reference** to this paper should be made as follows: Gruzauskas, V., Burinskiene, A., Airapetian, A. 2024. Digital transformation in food retail: a case study of Lithuania e-grocery buying behaviours. *Entrepreneurship and Sustainability Issues*, 11(3), 65-84. [http://doi.org/10.9770/jesi.2024.11.3\(5\)](http://doi.org/10.9770/jesi.2024.11.3(5))

**JEL Classifications:** L66

## 1. Introduction

Understanding consumer behaviour in food consumption and e-commerce is increasingly important in today's digital age. The advent of the COVID-19 pandemic has served as a catalyst, driving a significant portion of consumers towards online grocery shopping platforms (Younes, Noland & Zhang, 2022; Gomes & Lopes, 2022). This trend is not merely a response to global health concerns; it also highlights the convenience of e-groceries and flexibility in daily life (Hood et al., 2020). Furthermore, this shift is not uniform across all demographics. Age, gender, ethnicity, and educational attainment are just some factors that influence these behavioural changes (Younes, Noland & Zhang, 2022; Hood et al., 2020; Park, 2023). The growing interest in online grocery shopping has had several ripple effects. For instance, there has been a notable shift towards healthier food and beverage consumption behaviours during the pandemic (Gomes & Lopes, 2022). This is corroborated by research that suggests that online grocery shopping could facilitate healthier food choices by

---

\* *The research was funded by the Research Council of Lithuania, "Dynamic routing for e-grocery delivery following sustainability (DREGS)", No. P-PD-22-009.*

minimizing impulsive purchases of unhealthy items (Pitts et al., 2018; Boustani, Ferreira & Guiné, 2021). However, this potential is tempered by consumers' hesitancy to purchase fresh produce online, which could counteract some of the benefits of shopping for healthier options (Pitts et al., 2018).

Moreover, consumer expectations regarding delivery services are evolving. In the German context, the needs of an ageing population have led to a higher demand for home-delivery services, especially in rural areas (Oeser et al., 2018). In South Korea, consumer preferences for delivery services show a strong inclination towards dawn deliveries using personal iceboxes, indicating that the type of packaging can be even more influential than the delivery time in shaping consumer choices (Park, 2023). The rapid growth of the online grocery shopping sector is influenced by a complex interplay of factors such as global health crises, demographic characteristics, and evolving consumer expectations (Younes, Noland, & Zhang, 2022; Gomes & Lopes, 2022; Oeser et al., 2018; Pitts et al., 2018; Hood et al., 2020; Park, 2023).

Understanding these nuances is essential for academia and the retail industry as they navigate the opportunities and challenges of this digital transformation. While e-commerce platforms have experienced an undeniable surge in usage and popularity, academic exploration of their impact on food demand remains surprisingly underdeveloped. This oversight is particularly noticeable given the transformative effects of online shopping on other commerce sectors. The convenience, vast product selection, and often competitive pricing of e-commerce platforms have altered buying habits and reshaped entire industries. In food demand, the effects of e-commerce become even more intricate. As consumers increasingly shift to online grocery shopping, a multitude of factors come into play: regional dietary preferences, accessibility to various food items, and the logistical challenges of delivering perishable goods, to name a few (Waitz, Mild, & Fikar, 2018; Waitz, Mild, & Fikar, 2018). Yet, most research in the area tends to focus either on traditional brick-and-mortar food consumption patterns or on e-commerce trends in general without delving into the unique intersection of the two. For instance, while some studies have attempted to understand customer preferences regarding e-grocery logistics through conjoint analyses (Waitz, Mild, & Fikar, 2018), these often need to be more open to specific cities or attributes and may not capture broader trends.

Furthermore, although advanced decision support systems have been introduced to tackle the logistical challenges of last-mile distribution (Waitz, Mild, & Fikar, 2018; Merchán & Winkenbach, 2018), these solutions often focus on logistical efficiency rather than consumer preferences or behavioural patterns. While advancements have been made in understanding specific aspects of e-grocery logistics and consumer preferences, a holistic view that integrates these insights with broader demographic and e-commerce trends remains a gap in the literature. This underscores the need for comprehensive studies examining the complex landscape of e-commerce's impact on food demand, offering valuable perspectives for industry stakeholders and policymakers. This lack of focused research leaves a significant knowledge gap for businesses and policymakers aiming to optimize e-grocery operations or address food security concerns, understanding the nuances of e-commerce. Without this understanding, there's a risk of making decisions based on incomplete or outdated models, potentially leading to inefficiencies, missed opportunities, or even exacerbating existing challenges in food accessibility. In particular, the novelty of our publication focuses on empirical evidence about e-grocery buying behaviours, encompassing factors such as local producers, temperature-controlled delivery, and various e-grocery aspects. Unlike other surveys that typically concentrate on only some of these aspects, our research pays particular attention to temperature-controlled delivery. This focus is crucial as one of the critical challenges in e-grocery logistics is delivering fresh and frozen products, which requires controlled-temperature vehicles. This not only complicates the delivery process but also adds significant costs due to the specialized nature of these vehicles (Seghezzi, Mangiaracina, & Tumino, 2023).

**Goal:**

To assess comprehensively the impact of digital transformation on food consumption patterns, particularly focusing on the dynamics of e-grocery adoption, to inform public health policy and e-commerce strategies.

**Objectives:**

1. To conduct a literature review exploring the intersections of ageing populations, health-conscious consumerism, and advanced e-grocery simulations.

2. To survey consumer behaviour and preferences in purchasing fresh food products through e-grocery platforms.
3. To derive recommendations for public health, digital grocery platforms, and e-commerce strategies based on insights from the survey findings.

## 2. Exploring the Evolution of Food Demand in the Digital Age: A Comprehensive Literature Review

In e-grocery, various surveys have delved into the intricacies of consumer behaviours and preferences, illuminating the multifaceted nature of this rapidly evolving sector. The study by Diagourtas, Kounetas and Simaki (2023) highlights the role of sociodemographic factors in organic food purchasing, revealing distinct motivations in different countries. Concurrently, Jaeger, Harker & Ares (2023) shed light on attitudes towards biodynamic agriculture, emphasizing environmental and biodiversity aspects. Vasko et al. (2023) explore household food waste in Montenegro, uncovering responsible food usage amidst the pandemic. Qaiser et al. (2023) focus on the transformative effects of COVID-19 on consumer consumption in Pakistan, identifying significant demographic influences. Wallnoefer and Riefler (2022) provide insights into Austrian consumers' perceptions of local food consumption during this global crisis. Kusz et al. (2023) offer an understanding of Polish consumers' purchasing behaviours under pandemic pressures, revealing gender and age as critical factors. Lastly, Kolondam et al. (2023) assess the impact of utilitarian, hedonic, and e-service quality on Indonesian consumer satisfaction in e-grocery shopping, pointing towards the importance of customer satisfaction in online environments. These studies underscore the dynamic and complex nature of consumer preferences and behaviours in e-grocery. They highlight the necessity for nuanced and adaptable strategies to cater to diverse consumer needs influenced by sociodemographic factors, cultural contexts, and extraordinary circumstances like the COVID-19 pandemic. This body of research forms a foundation for understanding the current landscape of e-grocery shopping and paves the way for future exploration and innovation in this sector.

The intersection of the ageing demographic with digital consumption is profoundly impacting e-commerce, particularly e-grocery. This trend reshapes older adults' interaction with technology and participation in the digital economy, presenting opportunities and challenges. While it offers convenience, it demands digital literacy and adaptation to new shopping modalities. Understanding these needs is vital for e-commerce solutions tailored to an ageing population, with market dynamics and social inclusion implications. The global demographic landscape is evolving, with the proportion of older individuals increasing. By 2050, nearly 22% of the worldwide population will be 60 or older (World Health Organization, 2015). This shift influences consumption patterns, notably in food shopping. Older adults often have specific dietary needs, impacting food demand. Studies by Younes, Noland, & Zhang (2022) and Gomes & Lopes (2022) reveal behavioural shifts in food shopping, with older individuals less likely to adopt online grocery shopping. This highlights the demographic nuances in e-commerce adoption.

Retailers and policymakers must consider these trends to cater to a diverse consumer base, balancing older individuals' needs with the growing online shopping trend. E-commerce platforms offer unique advantages in catering to an ageing global population, mainly through their ease of use and convenience. For older individuals who may face physical limitations or reduced mobility, the ability to access a vast array of products at the click of a button is not merely a convenience but often a necessity. Moreover, the personalized nature of these platforms allows for saved dietary preferences and easy repeat orders, further enhancing the shopping experience for those who may find the extensive options in physical stores overwhelming. This understanding aligns well with the comprehensive study conducted by Oeser, Aygün, Balan, et al. (2018), which delves into the implications of an ageing population on the food demand chain in Germany. Their research uses a holistic demand-chain approach to explore how older consumers' physical, psychological, and behavioural characteristics influence different facets of the food chain. From the layout of retail spaces to food packaging and logistics planning, the ageing demographic leaves its imprint on numerous aspects of the food industry. One of the study's key findings is the rising demand among older individuals for home-delivery services, especially in rural regions. This suggests a growing recognition of the logistical challenges and opportunities of catering to an older consumer base, emphasizing the role of industry 4.0 solutions in ensuring an efficient food supply.

The intersection between an ageing population and the rise of e-grocery shopping presents both opportunities and challenges.

The convenience and accessibility of online platforms offer a compelling value proposition for older individuals, especially those with limited mobility or specific dietary needs. However, it's essential to acknowledge the digital divide that may prevent older adults, who are generally less tech-savvy, from fully embracing e-commerce. This issue underscores the importance of user-friendly interfaces, robust customer support, and, potentially, the development of hybrid models that combine online and in-store shopping benefits. Understanding these dynamics is crucial for e-commerce platforms seeking to cater effectively to an ageing demographic. This nuanced landscape is further elaborated in various comprehensive studies. For instance, the research by Pitts et al. (2018) underscores the dual nature of online grocery shopping. While online platforms could encourage healthier choices by reducing impulse purchases and enabling better use of nutritional information, the study also notes a hesitancy among consumers to purchase fresh produce online, potentially leading to less healthy choices. This dichotomy becomes even more relevant for older adults, who may have specific health-related dietary needs.

Similarly, the study by Hood et al. (2020) explores the developed landscape of the UK's e-grocery industry, highlighting the various shopping channels made available due to technological advancements. Interestingly, the research points out that while younger demographics and affluent households show a significant inclination towards home delivery, the same preference is strongly noted among those over 55. This aligns well with the idea that older adults, despite potential limitations in tech-savviness, do see the value in the convenience offered by online grocery platforms. Moreover, the study by Park (2023) provides an international perspective by examining South Korean consumers' preferences in online grocery delivery. The research identifies strong consumer preferences for specific delivery times and packaging types, with a notable finding that packaging type was more influential than delivery time in consumer decisions. Given that older individuals may have particular needs or preferences, such as for eco-friendly packaging or delivery during specific times, these insights are valuable for e-grocery companies looking to tailor their services to this demographic.

While e-grocery shopping offers many advantages that could benefit an ageing population, there are also hurdles to overcome, including technological barriers and the need for specialized services. The cited studies emphasize the importance of understanding consumer behaviours, preferences, and hesitations, making it clear that a one-size-fits-all approach is unlikely to be successful. As the global population ages, e-commerce platforms have both the challenge and the opportunity to innovate and adapt, ensuring they can effectively meet the diverse needs of this growing demographic.

In recent years, a significant shift towards health-conscious consumerism has permeated various sectors, including the food industry. An increasing awareness and preference for healthier food choices, organic products, and a general inclination towards wellness-oriented lifestyles characterizes this movement. Consumers are more informed about the nutritional aspects of their food and are more concerned about the environmental and ethical implications of their consumption habits. This rise in health-conscious consumerism is particularly noticeable in e-commerce, where digital platforms have made it easier for consumers to access a broader range of healthy and specialized food options. As a result, the demand for such products is influencing the supply chains, marketing strategies, and product offerings of food retailers and e-grocery platforms. Understanding this shift is crucial for stakeholders in the food industry to align their strategy with consumer preferences and for public health advocates to leverage this trend in promoting healthier eating habits.

The transformation towards healthier and more sustainable food choices is a fleeting trend and a paradigm shift that has gained considerable momentum in recent years. This change is propelled by a heightened awareness of health benefits, scepticism of processed foods, and an increased focus on environmental sustainability. Supporting this observation, the Organic Trade Association has reported consistent growth in the organic food market, indicating that consumers are increasingly willing to invest in healthier and more eco-friendly options. Various reputable studies and surveys further corroborate this trend, offering nuanced insights. For instance, a report shows that approximately 65% of consumers aim to make spending choices that contribute to a healthier and more sustainable lifestyle (World Economic Forum, 2023). Another study found that environmental

concerns motivate 16% of consumers to pursue healthy and sustainable eating, marking a significant increase from previous years.

Moreover, 77% of consumers are either increasing or considering increasing their fruit and vegetable consumption, reinforcing the shift towards plant-based diets (IGD, 2021). This trend toward plant-based foods is not just anecdotal. Still, it is quantified by projections from the World Resources Institute, which estimates that sustainable food will constitute a \$2 trillion industry in 2022 (Acterra, 2022). The fast-food industry has also noted, with many companies introducing plant-based meat alternatives to cater to evolving consumer demands. The COVID-19 pandemic has catalyzed this transformation, pushing consumers even more decisively towards fresher and healthier food choices (Grimmelt et al., 2022). Reports from McKinsey & Company indicate that even before the pandemic, people from diverse demographic backgrounds explored conscious eating for varied health and sustainability goals. This trend has only accelerated in the wake of the pandemic. The 2022 Food & Health Survey by the International Food Information Council adds another layer to this narrative (IFIC, 2022). The survey revealed that many Americans have adopted specific diets or eating patterns, primarily motivated by long-term health benefits and weight loss.

Additionally, the study found a growing emphasis on plant-based proteins and dairy alternatives. Notably, the survey indicated a substantial increase—from 27% in 2019 to 39% in 2022—in the percentage of Americans considering environmental sustainability when making food and beverage purchases. The global shift towards healthier and more sustainable food options is multifaceted, driven by consumer awareness and environmental concerns, and even accelerated by the ongoing pandemic. It's a trend substantiated by multiple credible sources, ranging from the Organic Trade Association to the World Economic Forum, IGD, Acterra, McKinsey & Company, and the International Food Information Council. These shifts are not just influencing consumer behaviours but also reshaping industries and market offerings, making it an essential area of focus for policymakers and businesses.

E-commerce platforms have been particularly adept at capitalizing on these evolving consumer preferences. Unlike traditional brick-and-mortar stores, online grocery stores offer high transparency and ease for health-conscious consumers. They feature dedicated sections for organic and health-centric products, provide in-depth information about ingredients, and often allow consumers to trace the origins of the products. This comprehensive product information, accessible with a simple click, has made online shopping the go-to choice for many who prioritize health and sustainability in their food choices. The complex interplay of consumer behaviours and food access is not just about preferences or marketing; it also has significant social implications. Research by Buscemi et al. (2023) sheds light on how food insecurity is intricately linked with socioeconomic status and geographical location. The study found that individuals with high levels of food insecurity are often confined to areas with low median incomes, corroborating the need to consider social and economic factors in food access strategies. Although their study did not find a direct link between food insecurity and grocery store density, it revealed that individuals with higher BMIs were more likely to live in low-income areas with fewer grocery options.

Similarly, a study by Livings et al. (2023) revealed the multifaceted barriers to food access exacerbated by the COVID-19 pandemic. While living in a food desert was not necessarily correlated with food insecurity, other barriers, such as restricted grocery store hours and lack of vehicle access, were significant contributors. The study underscores the importance of addressing these geographic and logistical disparities in enhancing food security and, by extension, in the offerings of online grocery platforms. Food demand and access dynamics are evolving rapidly, influenced by a myriad of factors, from consumer preference for healthier options to socioeconomic constraints. E-commerce platforms stand at the crossroads of this change. They offer unprecedented convenience and information, instrumental in driving consumers toward more beneficial and sustainable options. However, they are also responsible for ensuring that this shift is equitable and devoid of misleading information. As online platforms grow, their role in shaping food consumption patterns becomes increasingly significant, warranting a multifaceted approach that considers both market trends and social realities.

This comprehensive analysis has underscored a significant gap in existing literature regarding e-grocery buying behaviours, particularly in temperature-controlled delivery. While previous studies have explored various facets of e-grocery dynamics, the specific focus on the complexities and logistical challenges of delivering fresh and frozen products has been markedly underexplored. This research gap is particularly noteworthy given the importance of maintaining product integrity and safety in delivering temperature-sensitive items. The current study's emphasis on empirical evidence, addressing both the consumer perspective and logistical intricacies of temperature-controlled deliveries, offers a novel contribution to the field. It illuminates the specific challenges and consumer expectations in this area. It sets the stage for future explorations and innovations in e-grocery logistics, thereby enriching the discourse on digital transformation in food consumption patterns.

### **3. Methodology: Assessing Digital Transformation in E-Grocery Consumer Behaviour**

The survey was conducted online, successfully garnering responses from 120 participants distributed across Lithuania, thereby ensuring a geographically diverse and representative sample for the study. This study employed a structured survey methodology to investigate the interplay between digital transformation and evolving food consumption patterns. The survey was methodically segmented into distinct sections to capture a comprehensive understanding of dietary behaviours and e-grocery adoption dynamics among varied demographic groups.

1. **Demographic Profiling:** Initial questions were designed to gather essential demographic data, such as age, gender, occupation, education, geographical location, income, and Body Mass Index (BMI), offering a foundation for contextual analysis.
2. **E-Grocery Shopping Preferences** (AlTarrah et al., 2021; Qaiser et al., 2023; Kolondam et al., 2023): Focused on elucidating preferences and behaviours in online grocery shopping, this part addressed delivery time preferences, reactions to delays, expectations regarding perishable goods, purchase frequency, and handling of missed deliveries.
3. **Local Food Sourcing Perceptions** (Diagourtas et al., 2022; Wallnoefer & Riefler, 2022; Jaeger, Harker & Ares, 2023; Kusz et al., 2023): Here, the survey probed attitudes towards locally-sourced food, encompassing aspects like importance assigned to local produce, purchase frequency, and willingness to pay a premium for local products, alongside assessing respondents' awareness of local food producers.
4. **Temperature-Controlled Food Concerns** (Navickas et al., 2015; Vasko et al., 2022; Park, 2023; Seghezzi et al., 2023): Dedicated to understanding perceptions and concerns related to temperature-controlled foods purchased online, this section explored purchase frequencies, types of foods bought, safety and nutritional concerns, trust in grocery store temperature control mechanisms, and confidence in the quality of these foods when bought online.

The methodology employed multiple-choice questions, ranking scales, and Likert scale responses, enabling a nuanced capture of data that reflects current trends and perceptions in dietary habits and digital grocery shopping. This comprehensive approach aims to provide robust insights for public health policy formulation and e-commerce strategy development in food consumption.

### **4. Results: Analysing E-Grocery Consumer Trends and Preferences**

This chapter delineates the findings from the survey, detailing the adoption and perception trends of e-grocery consumers. It dissects the collected data to clearly understand consumer behaviours, exploring the digital transformation in grocery shopping. This assessment aims to identify critical factors influencing consumer preferences and discern patterns within the e-grocery market. The analysis in this chapter informs e-commerce strategies and offers a critical understanding of the current state and potential future directions of digital food retail.

**Table 1.** Demographic statistics

Question	Label	Frequency	Percentage	
Gender	Woman	88	73	
	Man	32	26	
Age group	15 to 19	27	22	
	20 to 24	42	35	
	25 to 29	6	5	
	30 to 34	21	17	
	35 to 39	9	7	
	40 to 44	5	4	
	45 to 49	2	1	
	50 to 54	3	2	
	55 to 59	4	3	
	60 to 64	1	0	
	Education	Basic education	1	0
		Primary education	4	3
Secondary education		58	48	
Higher education		45	37	
Post-secondary education		12	10	
Employment	Student	59	49	
	Employed person	53	44	
	Other, not in the labour force	5	4	
	Unemployed person	3	2	
Monthly Income (NET)	Less than 300 euros per month	36	30	
	300 - 500 euros per month	16	13	
	500 - 800 euros per month	13	10	
	800 - 1000 euros per month	11	9	
	1000 - 1500 euros per month	21	17	
	1500 - 2000 euros per month	10	8	
	More than 2000 euros per month	13	10	

In the survey, we gathered data on various demographic aspects of e-grocery consumers. The results, as detailed in Table 1, reveal exciting insights into the gender distribution, age groups of the respondents, education, profession and income.

Regarding gender, most of the survey participants were women, accounting for 73% (88 respondents) of the total. Men represented 26% (32 respondents) of the sample. This skew towards female participants suggests a potentially greater engagement or interest of women in e-grocery services, a point that may warrant further investigation.

The age group data shows a diverse range of participants. The most represented age group was '20 to 24 years', comprising 35% (42 respondents) of the participants, indicating a strong inclination towards e-grocery services among younger adults. This was closely followed by the '15 to 19 years' age group, which accounted for 22% (27 respondents) of the sample. The '30 to 34 years' age group comprised 17% (21 respondents), while other age groups had lower representation. These findings suggest a significant trend of e-grocery adoption among younger demographics, possibly reflecting their comfort with digital platforms and online shopping.

A significant portion, 48% (58 respondents), reported having completed secondary education. Those with higher education, such as a university degree, comprised 37% (45 respondents) of the participants. Additionally, 10% (12 respondents) reported post-secondary education, indicating a considerable level of educational attainment among the survey participants. Only a small number had primary education or basic education, with 3% (4 respondents) and 1 respondent respectively. This distribution suggests that a majority of e-grocery consumers in the survey have at least secondary education, highlighting a potentially literate and informed customer base. Moving on to employment status, the data shows a diverse range of occupations among e-grocery consumers. The largest group was students, making up nearly half of the respondents at 49% (59 individuals). Close behind were employed persons, who accounted for 44% (53 respondents). A smaller segment, 4% (5 respondents), included individuals who were neither studying nor employed, falling under the category 'Other, not in the labour force'. Unemployed persons were the least represented in the survey, with just 2% (3 respondents). This

variation in employment status reflects the broad appeal of e-grocery services across different occupational backgrounds.

The monthly income section of the survey provides insight into the financial demographics of the e-grocery shopping population. The data indicates a diverse range of income levels among the respondents. A significant portion of the survey participants, 30% (36 individuals), reported a monthly income of less than 300 euros, which suggests that individuals from lower-income brackets are utilizing e-grocery services. This could have implications for e-commerce platforms regarding pricing strategies and the affordability of delivery services. The next substantial income category is those earning between 1000 and 1500 euros per month, representing 17% (21 individuals) of respondents. This indicates that e-grocery shopping also appeals to middle-income earners who may prioritize the convenience that e-grocery platforms provide. Respondents in the 300 - 500 euros and 500 - 800 euros per month brackets each comprise a similar proportion of the population, at 13% (16 individuals) and 10% (13 individuals), respectively. This further supports the notion that e-grocery shopping is not exclusive to any single economic demographic. Those earning between 800 - 1000 euros and 1500 - 2000 euros per month each account for a smaller yet significant share, at 9% (11 individuals) and 8% (10 individuals), respectively. This illustrates that e-grocery platforms are servicing a broad economic spectrum of consumers. Interestingly, the survey also indicates that e-grocery platforms are utilized by individuals in the higher income brackets, with 10% (13 individuals) reporting a monthly income of more than 2000 euros. This suggests that the convenience of e-grocery shopping is recognized across different income levels, including those with greater financial resources. Overall, the monthly income data from the survey suggests that e-grocery services cater to a wide range of economic backgrounds, highlighting the need for e-commerce platforms to consider diverse pricing and service options to meet the needs of their varied customer base.

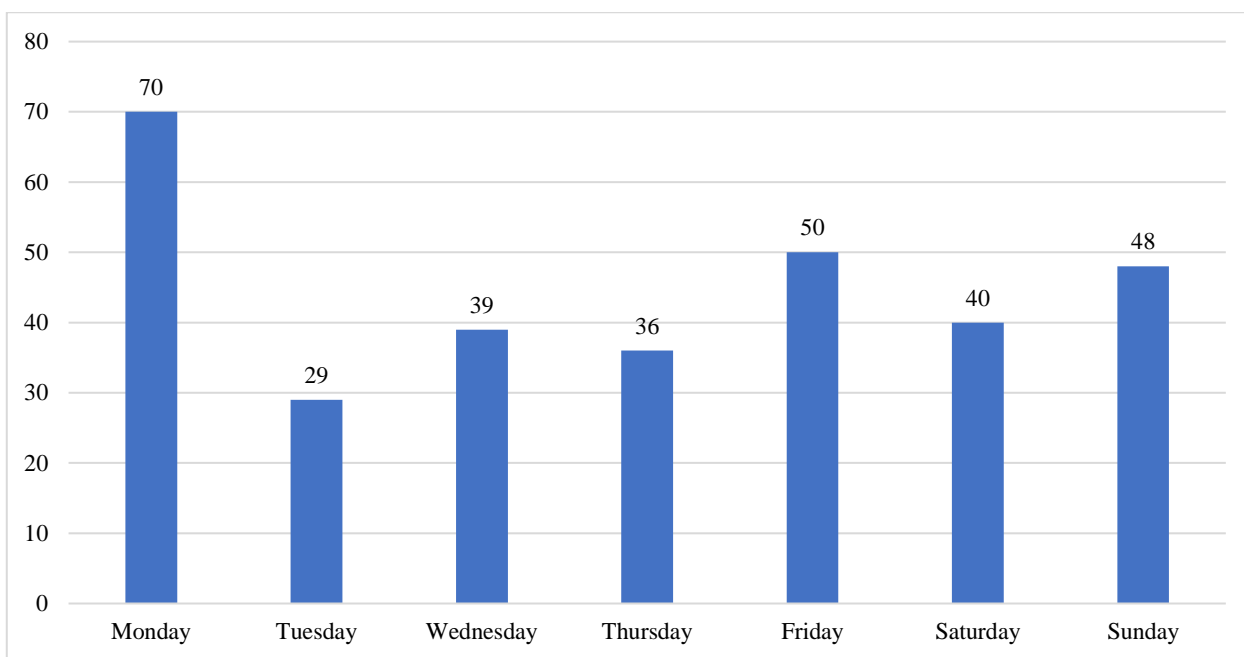


Figure 1. Preferences for day order

Figure 1 illustrates consumer preferences for the day of the week to place e-grocery orders. Monday stands out as the most popular day, with a clear peak at 70 orders, suggesting that many consumers prefer to start their week by organizing their food purchases. In contrast, Tuesday sees a significant drop to 29 orders, making it the least preferred day for placing e-grocery orders within this sample. Midweek days like Wednesday and Thursday show a moderate preference, with 39 and 36 orders, respectively. As the week progresses towards the weekend, there's an upward trend in preference. Friday marks the beginning of this increase with 50 orders, indicating that many consumers may be planning for the weekend. Saturday experienced a slight decrease to 40 orders, which could be attributed to consumers engaging in other weekend activities. However, there's a resurgence in preference on Sunday with 48 orders, possibly as consumers prepare for the upcoming week. The



distribution of preferences throughout the week could reflect varying consumer routines and the desire to ensure fresh food availability for specific days. It's also noteworthy that the preferences for Monday and Sunday are high, framing the week with the most significant activity in e-grocery orders, which might be aligned with typical workweek patterns and preparation for weekdays. These trends offer valuable insights for e-grocery service providers, indicating potential peak and off-peak days for order fulfilment and could inform the optimization of delivery logistics and inventory management.

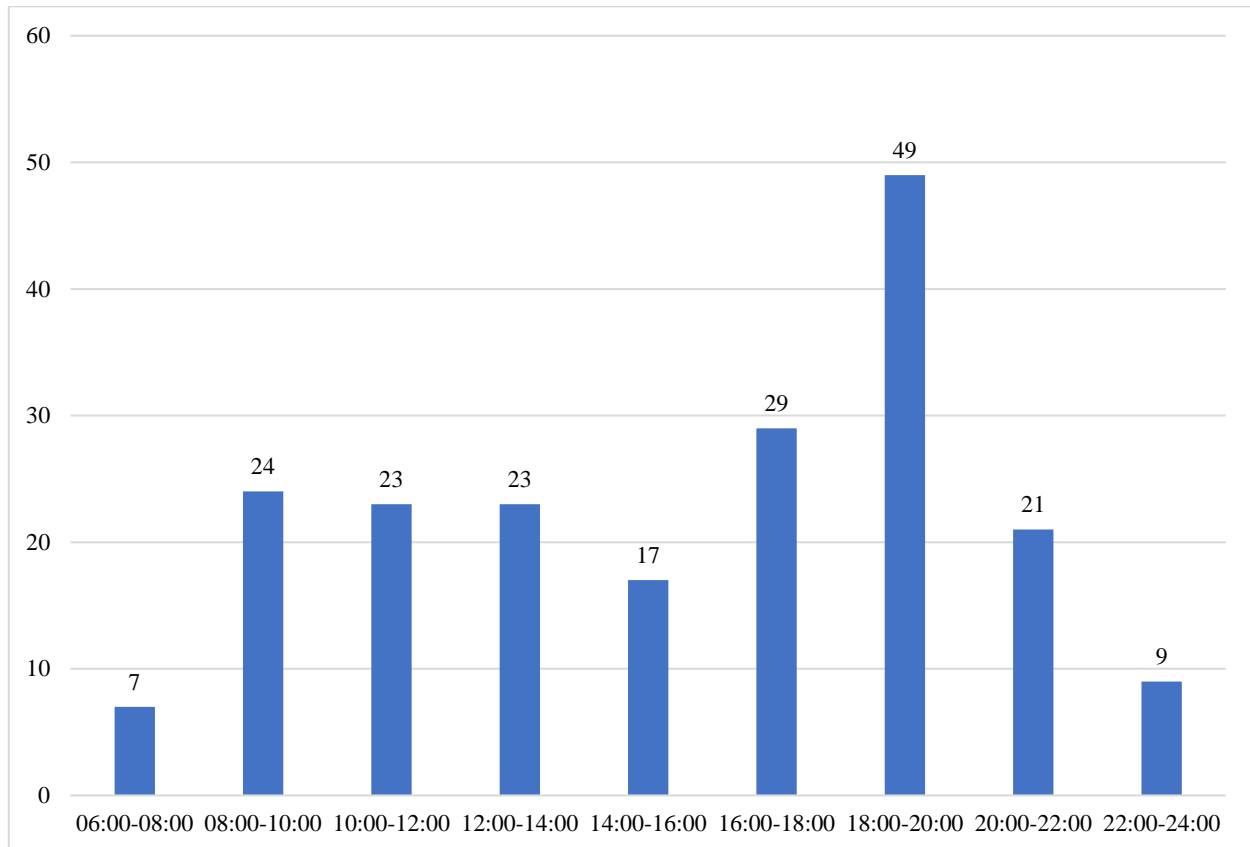


Figure 2. Consumer Preferences for E-Grocery Order Timing

From Figure 2, we can discern that the early hours of 6:00-8:00 AM are the least preferred for placing orders, with only 7 individuals choosing this time frame, suggesting that few consumers engage in e-grocery shopping first thing in the morning. The hours of 8:00-10:00 AM, 10:00-12:00 PM, and 12:00-14:00 PM show a consistent level of preference, with each time slot garnering 24, 23, and 23 orders, respectively, indicating a moderate and steady engagement throughout the late morning to early afternoon period. Consumer activity shows a dip during the mid-afternoon hours of 14:00-16:00 PM, with only 17 orders, possibly reflecting a lull in shopping activity as people might be occupied with work or other day-to-day tasks. However, there is a noticeable increase in the late afternoon and early evening, with the 16:00-18:00 PM slot attracting 29 orders. This could be attributed to individuals wrapping up their work or daily activities and finding the time to place their grocery orders. A significant spike is observed in the 18:00-20:00 PM slot, which records the highest preference at 49 orders, suggesting that this is the prime time for consumers to engage in e-grocery shopping, potentially due to the conclusion of the typical workday. Following this peak, there's a decline in the later evening hours with 21 orders during 20:00-22:00 PM and a further decrease to 9 orders in the late-night slot of 22:00-24:00 PM, as people are likely preparing to end their day. The data indicate that evening hours, particularly after work, are the most favoured for placing e-grocery orders, with a notable peak in early evening. These insights are essential for e-grocery businesses to optimize their staffing and logistics for order processing, ensuring they are best equipped to handle higher orders during these peak times.

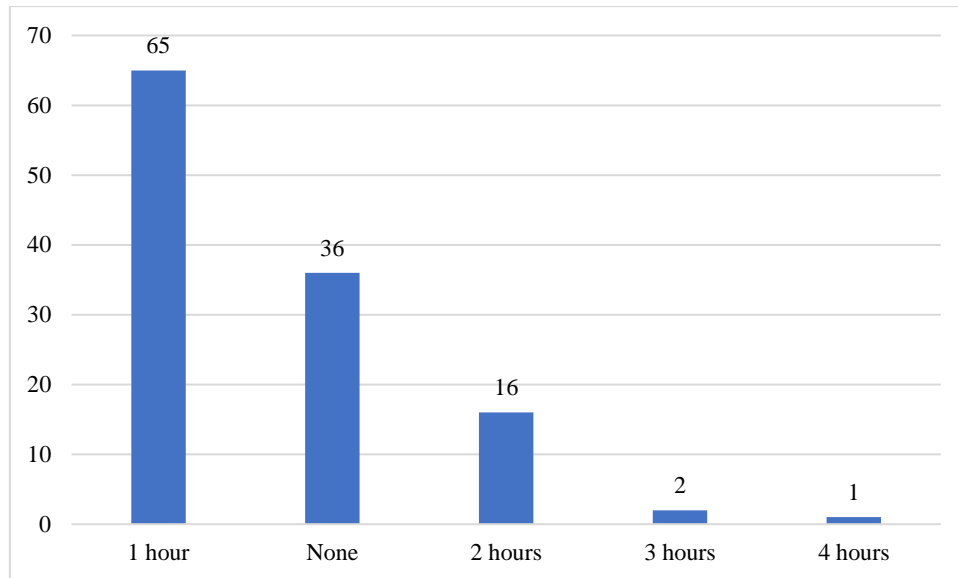


Figure 3. Delivery delay tolerance

Figure 3 illustrates consumer tolerance for delivery delays when ordering from e-grocery services. From the chart, it's clear that most consumers (65 individuals) are willing to tolerate a delay of up to 1 hour, indicating a reasonable level of patience and understanding towards minor deviations from the scheduled delivery time. Conversely, a substantial number of consumers (36 individuals) indicated no tolerance for delivery delays, highlighting a market segment with strict expectations for on-time delivery. As the potential delay increases, consumer tolerance sharply decreases. Only 16 individuals are willing to accept a 2-hour delay, suggesting that as wait times grow, customer satisfaction likely diminishes. For longer delays of 3 and 4 hours, the tolerance levels drop significantly further, with just 2 and 1 individuals respectively open to such extended wait times. This steep tolerance decline underscores timely deliveries' importance in maintaining customer satisfaction and loyalty.

Table 2. Preferences when delivery is late

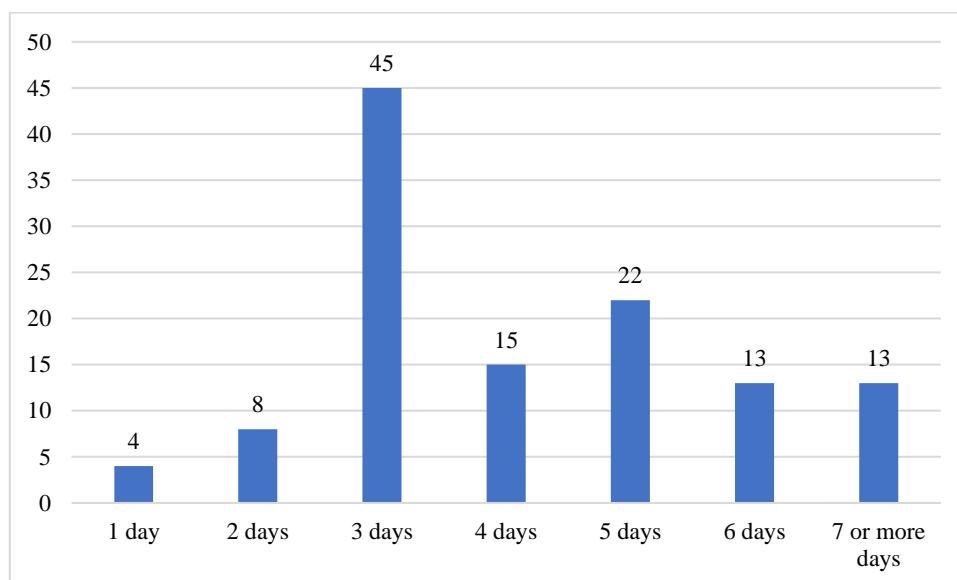
Preference	Frequency	Percentage
I only accept deliveries when I am home	59	49
At the door	43	36
In the yard (private house)	9	8
At a nearby pickup location / store	5	4
At the neighbour's	4	3

Table 2 presents the preferences of e-grocery consumers when faced with a late delivery scenario. The most preferred option, chosen by approximately 49.17% of respondents (59 individuals), is only accepting deliveries when they are home. This preference indicates a significant portion of consumers prioritize being present to receive their groceries, which may be due to concerns over food safety, theft, or personal convenience. The second most popular option, with 35.83% (43 respondents), is to have the groceries left at the door. This choice suggests a level of trust in the delivery process and a preference for the convenience of not needing to be home to receive the items. A smaller segment of the sample, 7.5% (9 respondents), prefers having items left in the yard if they reside in a private house. This option might be favoured due to its security and privacy, especially in areas where leaving items at the door may not be safe or practical. Another alternative, preferred by 4.17% (5 individuals), is to collect the late delivery from a nearby pickup location or store. This preference could be driven by the consumer's desire for flexibility and control over the retrieval of their groceries. Lastly, having groceries left at the neighbour's is the least favoured option, with only 3.33% (4 respondents) selecting this. This low percentage could reflect concerns about imposing on neighbours or uncertainty about the neighbour's availability to receive the delivery. Overall, Table 2 reveals a clear preference for personal receipt of deliveries, with a majority of consumers opting for direct delivery to their home or at the door, signifying the importance of flexible and reliable delivery services in the e-grocery sector.

**Table 3.** Preference for failed delivery

Preference	Frequency	Percentage
Cancel the order and get a refund	43	34
Pickup from a nearby location	40	33
Reschedule for another day	37	28

Table 3 outlines consumers' preferences in the event of a failed e-grocery delivery. The most common preference, selected by approximately 34.17% of respondents (43 individuals), is to cancel the order and receive a refund. This choice may reflect a consumer's desire for immediate resolution and financial reimbursement when service expectations are not met. Nearly as many respondents, about 33.33% (40 individuals), prefer picking up their groceries from a nearby location following a failed delivery. This alternative suggests a segment of the market values convenience. It may be willing to take additional steps to retrieve their items rather than wait for another delivery attempt or process a refund. Rescheduling the delivery for another day is a slightly less popular option, chosen by 28.33% (37 respondents). This preference indicates that many consumers are flexible and willing to accommodate another delivery time, possibly due to their importance on receiving their specific grocery items. Overall, Table 3 highlights a split in consumer preferences regarding failed deliveries, with no single option overwhelmingly favoured.



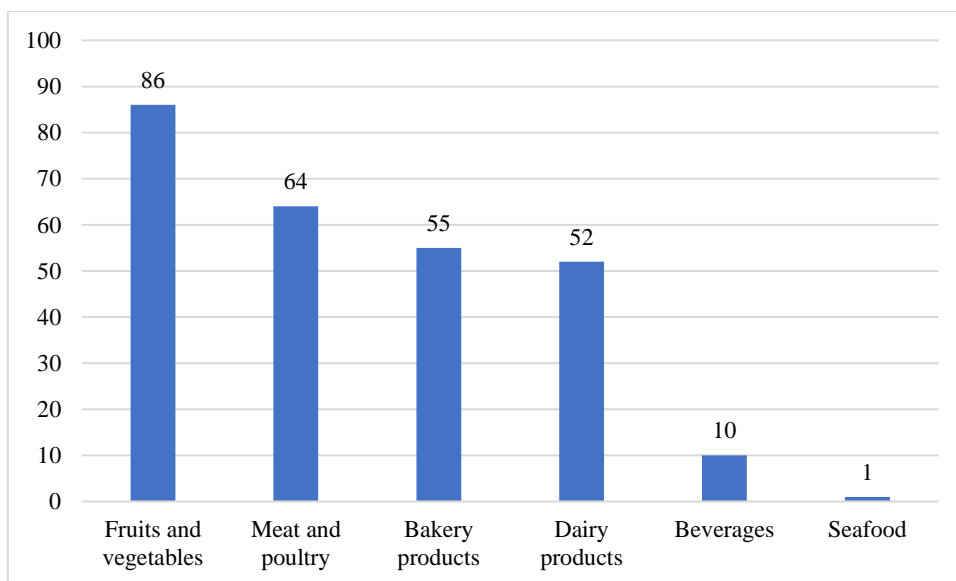
**Figure 4.** Preferred shelf life when buying fresh products

Figure 4 displays the preferred shelf life for fresh products as indicated by e-grocery shoppers. The chart shows a strong preference for a shelf life of 3 days, with 45 individuals choosing this option, suggesting that consumers seek a balance between freshness and practicality in their perishable goods. A shelf life of 1 day is the least preferred, with only 4 respondents opting for it, which may reflect concerns about the immediate need for consumption or potential waste. Preferences gradually decrease as the shelf life extends to 4 and 5 days, chosen by 15 and 22 individuals, respectively, indicating that while there is still a demand for relatively long-lasting freshness, there is less desire for products that may sit for an extended period before use. The preference levels out for shelf lives of 6 days and 7 or more days, with each category chosen by 13 respondents. These choices may reflect a smaller consumer segment that plans their shopping less frequently or requires longer-lasting freshness due to lifestyle or scheduling constraints. Overall, this data suggests that e-grocery retailers should prioritize stocking fresh products with an optimal shelf life of around 3 days to meet the majority's preference while catering to varied needs for shorter and longer shelf-life expectations.

**Table 4.** Preferences for locally sourced products

Criteria	Category	Frequency	Percentage
Importance of locally sourced products	Very unimportant	7	6
	Unimportant	14	12
	No difference	47	39
	Important	39	33
	Very important	13	11
Frequency of purchased local products	Never	2	2
	Rarely	26	22
	Sometimes	54	45
	Often	34	28
	Always	4	3
Would buy online if products were from local producers	No opinion	53	44
	Yes	41	34
	No	26	22

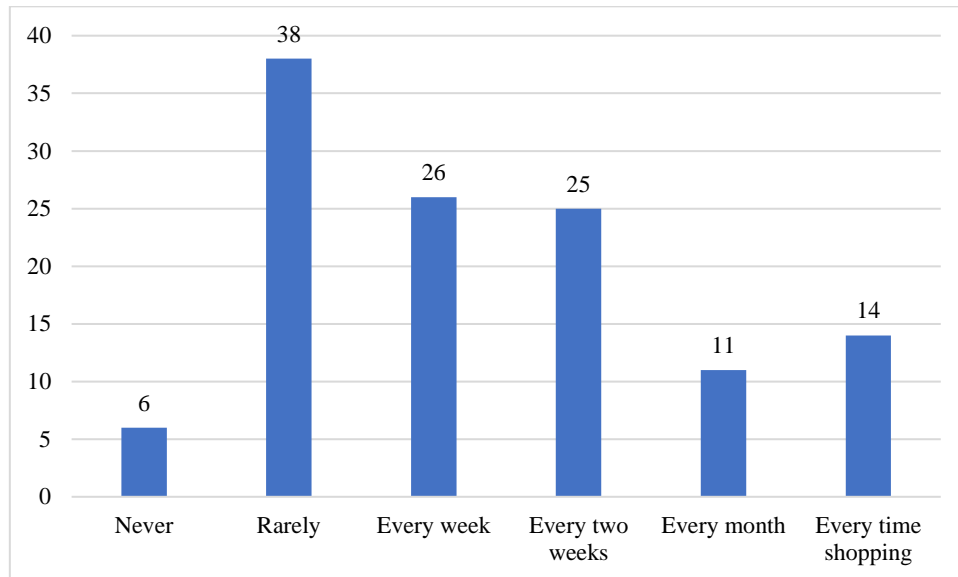
From Table 4, it is observed that the largest group of respondents, representing 39.17% (47 individuals), perceives no difference in whether the products are locally sourced or not. This suggests that for a significant portion of consumers, the local aspect of produce is neither a deterrent nor an incentive when making purchasing decisions. Meanwhile, a substantial number of consumers place value on local sourcing, with 32.5% (39 individuals) considering it important and a further 10.83% (13 individuals) viewing it as very important. These consumers likely appreciate the benefits associated with local sourcing, such as supporting local farmers, ensuring fresher goods, and contributing to sustainability efforts. Conversely, a smaller percentage of the sample deem locally sourced products as unimportant (11.67% or 14 individuals) or very insignificant (5.83% or 7 individuals), indicating that factors other than the origin may play a more significant role in their purchasing decisions, such as price, convenience, or brand preference.



**Figure 5.** Purchased food categories from local producers

Figure 5 depicts consumer purchasing patterns from local producers across various food categories. Fruits and vegetables emerged as the most frequently purchased category from local producers, with a striking 86 mentions. This preference underscores a widespread consumer desire for fresh, locally grown produce, often associated with better taste and nutritional value. Meat and poultry hold the second spot with 64 mentions, indicating a strong preference for locally sourced options in these categories. Consumers might prefer local sources for reasons such as supporting local economies, perceived freshness, or ethical considerations related to the treatment of animals. Bakery products are the third most common choice, with 55 mentions suggesting a significant appreciation for local bakeries and the artisanal quality of their products. Dairy products closely follow with 52 mentions, showing a preference for local dairy, possibly due to the perception of higher quality

and freshness or the desire to avoid processed alternatives. Beverages and seafood have markedly fewer mentions, with 10 and 1, respectively, suggesting these categories are less frequently associated with local sourcing by consumers. The low number of seafood could be due to geographic limitations, as consumers in landlocked areas have limited access to locally sourced seafood. The data indicates a clear consumer inclination towards purchasing fresh and perishable items like fruits, vegetables, and meats from local producers, with a notable drop in preference for either shelf-stable items or less commonly sourced locally.



**Figure 6.** Frequency of temperature-controlled product purchase

Figure 6 presents the frequency with which consumers purchase temperature-controlled products from e-grocery platforms. The category "Rarely" stands out as the most selected option, with 38 individuals indicating that they seldom buy temperature-controlled items online. This could suggest a degree of consumer apprehension towards purchasing such products without physical inspection or concerns about the ability of e-grocery services to maintain proper temperature control during delivery. The next most common frequency is purchasing temperature-controlled products weekly, chosen by 26 respondents. This group likely consists of consumers who trust the delivery process and have incorporated e-grocery shopping into their routine. The option of buying these products every two weeks is nearly as prevalent, with 25 respondents selecting it, indicating a bi-weekly grocery shopping habit that includes temperature-sensitive items. A smaller number of consumers, 11 respondents, reported making such purchases every month. This could reflect a market segment planning their grocery shopping extensively or purchasing temperature-controlled products in person. Interestingly, 14 respondents indicated they purchase temperature-controlled products every time they shop online, demonstrating a segment of consumers who are possibly very comfortable with the reliability of temperature control in e-grocery logistics. Only 6 respondents stated they never purchase temperature-controlled products online, possibly due to a lack of need or significant concerns over product quality and safety during transit.

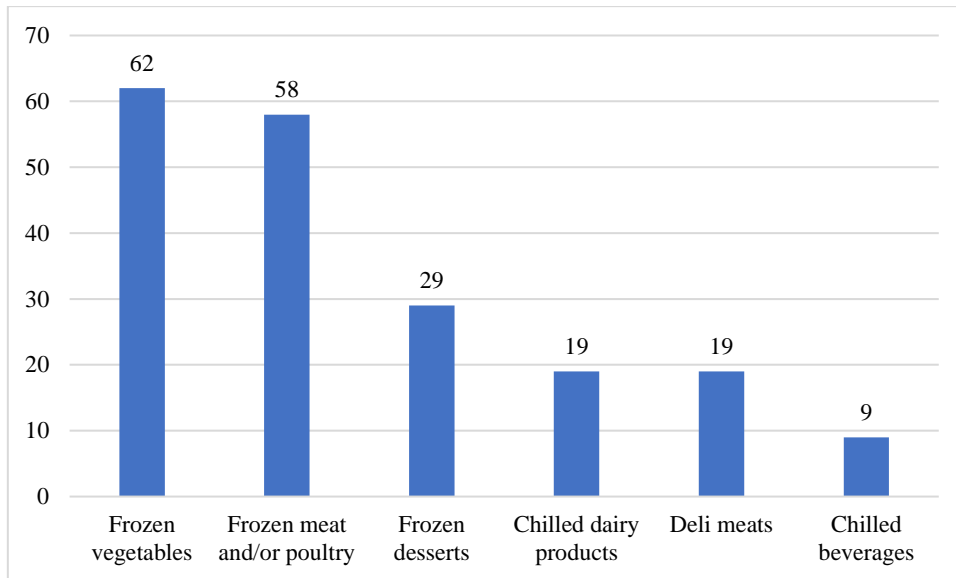


Figure 7. Purchased temperature-controlled food categories

Figure 7 illustrates consumers' preferences when purchasing various temperature-controlled food categories from e-grocery stores. Frozen vegetables are the most commonly purchased category, with 62 instances. This high number indicates a significant consumer preference for purchasing these products online, which could be due to their longer shelf life and convenience. Frozen meat and/or poultry is another highly purchased category, with 58 mentions. The popularity of frozen proteins suggests that consumers trust the e-grocery delivery system to maintain the integrity of these products during transit. Frozen desserts follow with 29 mentions, indicating a moderate preference for buying these items online. This could be because frozen desserts are seen as non-essential items compared to the staples of vegetables and meat. Chilled dairy products and deli meats are equally purchased, each receiving 19 mentions. The equal preference may suggest that consumers are generally comfortable purchasing refrigerated items but may have less need to buy these products as frequently as frozen goods. Lastly, chilled beverages are the least purchased category, with only 9 mentions. This could be due to the availability of these items in other, more immediate retail settings or a lesser need for these products to be temperature-controlled during delivery. Overall, the data from Figure 7 indicates that consumers are most inclined to purchase staple food items such as vegetables and meat from e-grocery services, with a lesser emphasis on chilled items like beverages, which could be more commonly purchased during regular shopping trips.

Table 5. Consumer Attitudes Toward Temperature-Controlled Food Delivery

Question	Answer	Frequency	Percentage
Do you think that temperature-controlled food products maintain their nutritional value?	Strongly disagree	4	3
	Disagree	26	22
	Unimportant	15	13
	Agree	70	58
	Strongly agree	5	4
Are you concerned about the safety of temperature-controlled food products (e.g., spoilage or freezer burn)?	Do not care at all	6	5
	Do not care	8	7
	Unimportant	23	19
	Care	70	58
	Care a lot	13	11
What is the longest time you think would be safe if temperature-controlled food products are not properly stored during delivery?	15 minutes	21	18
	30 minutes	31	26
	1 hour	43	36
	2 hours	10	8
	I do not think it is safe at any time	15	13
Would you buy temperature-controlled food products online?	Definitely not	16	13
	No	21	18
	I do not know	54	45
	Yes	22	18
	Definitely yes	7	6

The survey investigated four different aspects of consumer attitudes and concerns regarding temperature-controlled food delivery. Table 5 provides a comprehensive insight into consumer preferences in this area. Regarding the importance of temperature control in food delivery, a majority of respondents, 58.33% (70 individuals), agreed with its significance, indicating a substantial consumer emphasis on maintaining the correct temperature to ensure food safety and quality. Only a minority, 3.33% (4 individuals), strongly disagreed, suggesting that this feature is not a priority for all consumers. Concerns about the safety of temperature-controlled foods during delivery were also prominent, with 58.33% (70 individuals) of participants expressing that they care about this aspect, and an additional 10.83% (13 individuals) indicating they care a lot. This concern is understandable, given the potential risk of spoilage and foodborne illnesses if temperature control fails during transit. When asked about the longest safe time for temperature-controlled food to remain unrefrigerated, the most common threshold was 1 hour, with 35.83% (43 individuals) considering it acceptable. A notable 12.5% (15 individuals) did not believe it is safe for these foods to be unrefrigerated at any time, highlighting a significant group that places strict limits on delivery times to ensure food safety. Lastly, when it comes to purchasing temperature-controlled food products from an e-grocery platform, 45% (54 individuals) were uncertain, indicating potential doubts about the ability of such platforms to handle these products adequately. Meanwhile, 18.33% (22 individuals) responded affirmatively, suggesting a level of trust in the current capabilities of e-grocery services.

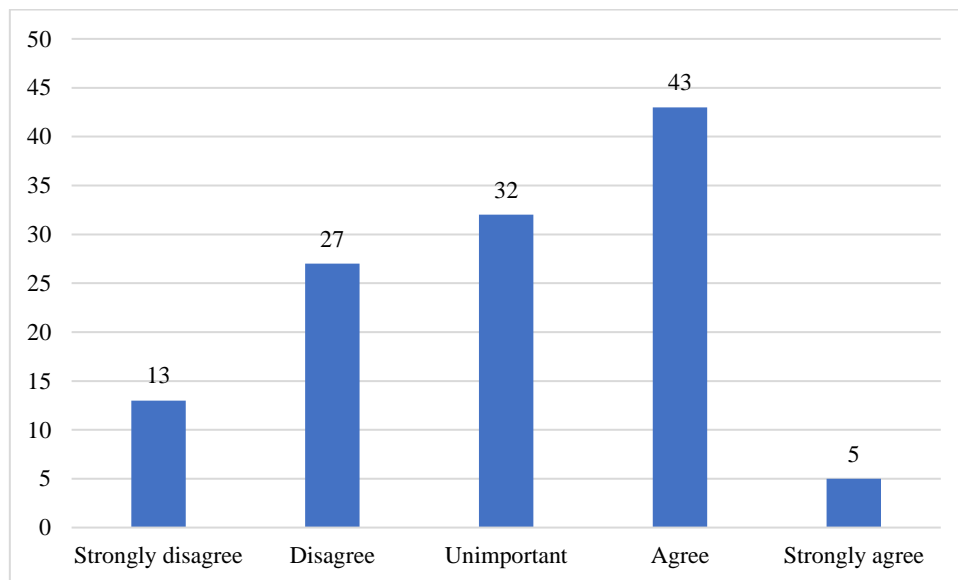


Figure 8. E-grocery helps to maintain a better diet

Figure 8 represents consumer opinions on whether e-grocery shopping contributes to maintaining a better diet. The largest group of respondents, 43 individuals, agree that e-grocery shopping helps maintain a better diet, suggesting that many consumers find the convenience and variety offered by online grocery shopping conducive to healthier eating habits. A significant portion, 32 respondents, remains neutral, indicating that they do not see a notable difference in their diet due to e-grocery shopping. This group may not perceive an impact or may not utilize e-grocery services in a way that affects their dietary choices. On the other side, 27 individuals disagree, and a smaller contingent of 13 respondents strongly disagree with the statement, making up a considerable section of the sample that does not associate e-grocery shopping with improving their diet. These consumers may be concerned about the healthy options available online or prefer to select fresh products in person. Lastly, a minority of 5 respondents strongly agree, implying a high confidence level in e-grocery shopping as a tool for enhancing dietary habits, possibly due to the ease of accessing nutritional information and making deliberate, healthy choices online. These insights into consumer perceptions reveal that while there is a trend towards believing in the positive impact of e-grocery on diet, there remains a diversity of opinions, indicating the need for e-grocery platforms to enhance features that promote healthy choices and educate consumers about the benefits of their offerings.

This chapter has consolidated the diverse strands of data into a coherent narrative that sheds light on the preferences and behaviours of e-grocery consumers. The insights garnered lay a foundation for e-commerce platforms to tailor their services more effectively, addressing the intricacies of consumer demand. As the digital grocery landscape continues to evolve, the findings underscore the need for ongoing research to navigate the shifting dynamics of consumer engagement and to ensure that e-commerce growth is both consumer-centric and sustainable.

## **Conclusion & Discussion**

Our research focused on the behaviours and preferences of e-grocery consumers in Lithuania. The main findings included strong engagement with e-grocery services, particularly among young adults and women, indicating a trend for targeted marketing and service enhancements. Respondents' diverse educational and occupational backgrounds highlight an informed and varied customer base for e-groceries. The study also explored preferences for order timing, reactions to delivery delays, and attitudes towards perishable goods and local sourcing. These insights contribute to understanding evolving consumer behaviours in the digital grocery landscape and inform strategies for e-commerce platforms. We notice several overlaps and contrasts when discussing these findings with other research. For example, Diagourtas et al. (2023) and Wallnoefer and Riefler (2022) also highlighted the influence of sociodemographic factors on consumer behaviours, though in the context of organic food and local food consumption, respectively. Both studies and the Lithuanian case emphasize the importance of understanding consumer motivations and preferences in different cultural and situational contexts. Jaeger, Harker & Ares (2023) and Vasko et al. (2023) focused on consumer attitudes towards specific food categories (biodynamic agriculture and food waste management), much like the Lithuanian study's exploration of local food sourcing and perishable goods. Collectively, these studies illustrate the diverse factors that influence consumer decisions in different regions. The findings of Qaiser et al. (2023) and Kusz et al. (2023) about the effects of COVID-19 on consumer behaviours in Pakistan and Poland, respectively, provide a broader context to understand the Lithuanian consumers' preferences during a pandemic. The impact of the pandemic on consumer behaviours across these studies underscores the need for adaptability and innovation in e-grocery services. Kolondam et al. (2023) and Park (2023) explored factors influencing e-grocery consumer satisfaction in Indonesia and South Korea, aligning with the Lithuanian study's focus on delivery preferences and service quality. These studies suggest a global trend towards prioritizing convenience, service quality, and tailored offerings in e-grocery shopping. Lastly, the study by AlTarrah et al. (2021) on the impact of COVID-19 in Kuwait offers a comparative perspective on how global events can uniformly influence consumer behaviours, echoing some of the trends observed in the Lithuanian study. Our survey distinctively hones in on the complexities of temperature-controlled delivery, a critical aspect of e-grocery that profoundly influences consumer trust and satisfaction, especially for perishable and frozen products. This focus is integral to understanding the logistics challenges and consumer preferences in maintaining product integrity during transit, a key area that sets our research apart.

The comprehensive analysis of survey data has revealed key insights into consumer behaviours and preferences in e-grocery shopping. It was observed that young adults, particularly women, are significantly engaged with e-grocery services, highlighting the potential for developing targeted marketing strategies and tailored services for this demographic. Additionally, the respondents displayed diverse educational backgrounds, with a predominance of at least secondary education, indicating an informed customer base. This diversity extended to their employment status, with students and employed individuals represented most, reflecting the broad appeal of e-grocery services across different occupational backgrounds. A distinct preference emerged for placing e-grocery orders at the start and end of the week, particularly in the evenings. This pattern suggests that e-grocery platforms should optimize their delivery logistics to accommodate these peak periods better. In terms of delivery expectations, while most consumers are willing to tolerate up to a one-hour delay, a significant portion expects punctual delivery, highlighting the importance of reliable and timely service. When faced with late deliveries, most consumers prefer personal receipts at home, valuing food safety and convenience. However, for failed deliveries, preferences were split, suggesting that e-grocery platforms should offer various solutions to cater to varying customer needs. The survey also revealed a preference for a three-day shelf life for fresh products, balancing freshness with practicality, which e-grocery retailers should consider in inventory management.



Regarding product sourcing, while a substantial number of consumers valued locally sourced products, a significant portion was indifferent, indicating the need for diverse product offerings by e-grocery retailers. A cautious approach was noted towards purchasing temperature-controlled items online, with consumers tending to buy these items less frequently. This suggests a need for e-grocery platforms to build trust in their delivery processes for temperature-sensitive products. Finally, many consumers agreed that e-grocery shopping aids in maintaining a better diet, yet a notable segment perceived online grocery shopping as neutral or ineffective in improving their diet, suggesting varied influences of e-grocery on dietary choices.

The survey results have significant implications for various stakeholders, including policymakers, e-commerce platforms, and other entities involved in the food supply chain. Understanding the nuances of these implications is crucial for strategizing and making informed decisions.

#### *Policymakers:*

Policymakers are crucial in shaping the e-grocery sector. Their role involves creating policies for equitable access to healthy online food options and promoting digital literacy for older adults. This is pivotal in enhancing consumer well-being and market expansion, and includes setting standards for reliable delivery services to protect consumer interests.

#### *E-Commerce Platforms:*

E-commerce platforms can leverage consumer insights to optimize delivery schedules and logistics, particularly during peak orders. Adapting to consumer preferences for delivery handling and offering a range of fresh, high-quality food options, including temperature-controlled products, can boost customer loyalty and trust, which is essential for the sector's growth.

#### *Local Producers and Suppliers:*

Local producers have an opportunity to enhance their presence on e-grocery platforms. They should focus on marketing the benefits of locally sourced products and educating consumers about their value. This approach can attract and convert customers, expanding the market presence for local products in the e-grocery sector.

#### *Logistics and Supply Chain Managers:*

Logistics and supply chain managers must focus on improving cold chain logistics for temperature-sensitive products. Innovations in packaging and real-time tracking can increase consumer trust and reduce apprehension, potentially increasing sales in this category. Enhancing cold chain logistics is vital to setting new standards in online grocery delivery and boosting overall consumer confidence.

While providing valuable insights into consumer behaviours and preferences in e-grocery shopping, the study has limitations. One notable limitation is the relatively small sample size, which restricts the generalizability of the findings. The sample predominantly comprised younger demographics, which may not accurately reflect the views and behaviours of older consumers or those from diverse backgrounds. While valuable for understanding a key segment of the e-grocery market, this focus on youth means that the findings might only partially represent the broader consumer base's perspectives and needs. Furthermore, the nature of this study as a pilot survey implies that it was exploratory and intended to provide preliminary insights rather than definitive conclusions. The scope of the survey was somewhat limited in terms of the breadth of topics covered and the depth of the questions asked. Given these limitations, future research should expand the sample size and include a more diverse range of participants to ensure a more comprehensive understanding of consumer behaviours across different demographics. Future surveys could also delve deeper into specific areas of interest that emerged from this pilot study, such as the role of e-grocery platforms in promoting healthier eating habits or the effectiveness of different delivery logistics strategies.

## References

- Acterra. (2022). Sustainable Food Trends for 2022. Retrieved from <https://www.acterra.org/blog/2022/1/28/sustainable-food-trends-for-2022>
- Boustani, N. M., Ferreira, M., & Guiné, R. P. (2021). Food consumption knowledge and habits in a developing country: a case of Lebanon. *Insights into Regional Development*, 3(4), 62-79. [https://doi.org/10.9770/IRD.2021.3.4\(5\)](https://doi.org/10.9770/IRD.2021.3.4(5))
- Buscemi, J., O'Donnell, A., Takgbajouah, M., & Patano, P. (2023). A Spatial Analysis of Food Insecurity and Body Mass Index with Income and Grocery Store Density in a Diverse Sample of Adolescents and Young Adults. *Nutrients*, 15(6), 1435. <https://doi.org/10.3390/nu15061435>
- Diagourtas, G., Kounetas, K. E., & Simaki, V. (2023). Consumer attitudes and sociodemographic profiles in purchasing organic food products: evidence from a Greek and Swedish survey. *British Food Journal*, 125(7), 2407-2423. <https://doi.org/10.1108/BFJ-03-2022-0196>
- Gomes, S., & Lopes, J. M. (2022). Evolution of the online grocery shopping experience during the COVID-19 Pandemic: Empiric study from Portugal. *Journal of Theoretical and Applied Electronic Commerce Research*, 17(3), 909-923. <https://doi.org/10.3390/jtaer17030047>
- Grimmelt, A., Moulton, J., Pandya, C., & Snezhkova, N. (2022). Hungry and confused: The winding road to conscious eating. McKinsey & Company. Retrieved from <https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/hungry-and-confused-the-winding-road-to-conscious-eating>
- Hood, N., Urquhart, R., Newing, A., & Heppenstall, A. (2020). Sociodemographic and spatial disaggregation of e-commerce channel use in the grocery market in Great Britain. *Journal of Retailing and Consumer Services*, 55, 102076. <https://doi.org/10.1016/j.jretconser.2020.102076>
- IGD. (2021). Consumers are increasingly open to adopting healthier and more sustainable diets. Retrieved from <https://www.igd.com/articles/article-viewer/t/consumers-increasingly-open-to-adopting-healthier-and-more-sustainable-diets/i/28997>
- International Food Information Council (IFIC). (2022). 2022 Food & Health Survey: Diets, Food Prices, Stress and the Power of Gen Z. Retrieved from <https://ific.org/media-information/press-releases/2022-food-health-survey/>
- Jaeger, S. R., Harker, F. R., & Ares, G. (2023). Consumer insights about sustainable and 'beyond organic' agriculture: A study of biodynamics in the United Kingdom, Australia, Singapore, and Germany. *Journal of Cleaner Production*, 401, 136744. <https://doi.org/10.1016/j.jclepro.2023.136744>
- Kolondam, Y., Reynaldi, E., Darmawan, K. A., & Setiowati, R. (2023). The Influence of Utilitarian, Hedonic, and E-Service Quality on Consumer Satisfaction Toward E-Grocery. *Indonesian Journal of Multidisciplinary Science*, 2(6), 2668-2679. <https://doi.org/10.55324/ijoms.v2i6.465>
- Kusz, B., Witek, L., Kusz, D., Chudy-Laskowska, K., Ostyńska, P., & Walenia, A. (2023). The Effect of COVID-19 on Food Consumers' Channel Purchasing Behaviors: An Empirical Study from Poland. *Sustainability*, 15(5), 4661. <https://doi.org/10.3390/su15054661>
- Livingston, M. S., Wilson, J., Miller, S., Bruine de Bruin, W., Weber, K., Babboni, M., ... & de la Haye, K. (2023). Spatial characteristics of food insecurity and food access in Los Angeles County during the COVID-19 pandemic. *Food Security*, 1-17. <https://doi.org/10.1007/s12571-023-01389-x>
- Merchán, D., & Winkenbach, M. (2018). High-Resolution Last-Mile Network Design. *City Logistics 3: Towards Sustainable and Liveable Cities*, 201-214. <https://doi.org/10.1002/9781119425472.ch11>
- Navickas, V., Baskutis, S., Gružasuskas, V., & Olencevičiūtė, D. (2015, April). The temperature control impact to the food supply chain. In Proceedings of the 20th International Conference, Kaunas, Lithuania (pp. 23-24).
- Oeser, G., Aygün, T., Balan, C. L., Corsten, T., Dechêne, C., Ibal, R., ... & Schuckel, M. T. (2018). Implications of the ageing population for the food demand chain in Germany. *International Journal of Retail & Distribution Management*, 46(2), 163-193. <https://doi.org/10.1108/IJRDM-01-2017-0012>
- Park, Y. J. (2023). Understanding Customer Preferences of Delivery Services for Online Grocery Retailing in South Korea. *Sustainability*, 15(5), 4650. <https://doi.org/10.3390/su15054650>
- Pitts, S. B. J., Ng, S. W., Blitstein, J. L., Gustafson, A., & Niculescu, M. (2018). Online grocery shopping: promise and pitfalls for healthier food and beverage purchases. *Public Health Nutrition*, 21(18), 3360-3376. <https://doi.org/10.1017/S1368980018002409>

Qaiser, S., Bashir, M. A., Ramish, M. S., Ansari, J., Gundala, R., & Bait Ali Sulaiman, M. A. (2023). Impact of consumer consumption adjustments on habits and purchase behavior during COVID-19. *Cogent Business & Management*, 10(3), 2265077. <https://doi.org/10.1080/23311975.2023.2265077>

Seghezzi, A., Mangiaracina, R., & Tumino, A. (2023). E-grocery logistics: exploring the gap between research and practice. *The International Journal of Logistics Management*, 34(6), 1675-1699. <https://doi.org/10.1108/IJLM-02-2021-0096>

Vasko, Z., Berjan, S., El Bilali, H., Allahyari, M. S., Despotovic, A., Vukojević, D., & Radosavac, A. (2022). Household food wastage in Montenegro: Exploring consumer food behaviour and attitude under COVID-19 pandemic circumstances. *British Food Journal*, 125(4), 1516-1535. <https://doi.org/10.1108/BFJ-01-2022-0019>

Waitz, M., Mild, A., & Fikar, C. (2018). A decision support system for efficient last-mile distribution of fresh fruits and vegetables as part of e-grocery operations. In Proceedings of the 51st Hawaii international conference on system sciences (pp. 1259-1267). University of Hawai'i at Manoa. <https://doi.org/10.24251/HICSS.2018.155>

Wallnoefer, L. M., & Riefler, P. (2022). Short-term effects of the COVID-19 outbreak on consumer perceptions of local food consumption and the local agri-food sector in Austria. *Agronomy*, 12(8), 1940. <https://doi.org/10.3390/agronomy12081940>

Wang, Q., Liu, X., Yue, T., Wang, C., & Wilson, J. P. (2015). Using models and spatial analysis to analyze spatio-temporal variations of food provision and food potential across China's agro-ecosystems. *Ecological Modelling*, 306, 152-159. <https://doi.org/10.1016/j.ecolmodel.2014.12.009>

Wichern, J., van Heerwaarden, J., de Bruin, S., Descheemaeker, K., van Asten, P. J., Giller, K. E., & van Wijk, M. T. (2018). Using household survey data to identify large-scale food security patterns across Uganda. *PLoS One*, 13(12), e0208714. <https://doi.org/10.1371/journal.pone.0208714>

World Economic Forum. (2023). Consumer Power: The Role of Net-Zero Goals in Shaping Food Producers, Suppliers, and Retailers. Retrieved from <https://www.weforum.org/agenda/2023/01/consumer-power-net-zero-food-producer-retailer-davos23>

Younes, H., Noland, R. B., & Zhang, W. (2022). Browsing for food: Will COVID-induced online grocery delivery persist? *Regional Science Policy & Practice*, 14, 179-195. <https://doi.org/10.1111/rsp3.12542>

**Funding:** The research was funded by the Research Council of Lithuania, “Dynamic routing for e-grocery delivery following sustainability (DREGS)”, No. P-PD-22-009.

**Author Contributions:** Conceptualization: *Aurelija Burinskienė*; methodology: *Aurelija Burinskienė, Valentas Gružas*; data analysis: *Valentas Gružas, Artur AIRAPTEIAN*; writing—original draft preparation: *Valentas Gružas, Artur AIRAPTEIAN*; review and editing: *Aurelija Burinskienė*; visualization: *Artur AIRAPTEIAN*. All authors have read and agreed to the published version of the manuscript.

**Valentas GRUŽAUSKAS** is an Associate Professor at Vilnius University, within the Faculty of Mathematics and Informatics. As a postdoctoral student at Vilnius Gediminas Technical University, he dedicates his efforts to the study and advancement of artificial intelligence, agent-based modelling, business analysis, and valuation. His primary research interests lie in exploring the dynamic fields of AI and its applications in business.

ORCID ID: <https://orcid.org/0000-0002-6997-9275>

**Aurelija BURINSKIENĖ** is a Professor at the Vilnius Gediminas Technical University, specializing in the Faculty of Business Management. Her academic focus encompasses a broad range of topics including e-logistics, transportation, and optimization. Her current main research interests are in developing innovative approaches within these areas, particularly in the context of enhancing business efficiencies and solutions.

ORCID ID: <https://orcid.org/0000-0002-4369-8870>

**Artur AIRAPTEIAN** is a Master's degree student at Vilnius University, Lithuania, specializing in Medicine. His academic pursuits are primarily focused on public health, general medicine, and the critical areas of information and knowledge management within the medical field. His current main areas of interest involve exploring the intersection of healthcare and information technology, aiming to contribute to advancements in medical practices and public health strategies.

ORCID ID: <https://orcid.org/0000-0003-3941-1563>

---

Copyright © 2024 by author(s) and VsI Entrepreneurship and Sustainability Center

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>



Open Access