



Online grocery shopping adoption versus non-adoption among the over-50s in Germany

Simone Braun¹ · Dunia Osman¹

Accepted: 21 March 2024
© The Author(s) 2024

Abstract

Online grocery shopping (OGS) has significantly risen due to accelerated retail digitization and reshaped consumer shopping behaviors over the last years. Despite this trend, the German online grocery market lags behind its international counterparts. Notably, with almost half of the German population aged over 50 and the 55–64 age group emerging as the largest user segment in e-commerce, the over-50 demographic presents an attractive yet relatively overlooked audience for the expansion of the online grocery market. However, research on OGS behavior among German over-50s is scarce. This study addresses this gap, empirically investigating OGS adoption factors within this demographic through an online survey with 179 respondents. Our findings reveal that over a third of the over-50 demographic has embraced OGS, indicating a growing receptivity for OGS among the over-50s. Notably, home delivery, product variety, convenience, and curiosity emerged as primary drivers for OGS adoption among this demographic. Surprisingly, most adopters did not increase online grocery orders since 2020 and a not inconsiderable proportion have even stopped buying groceries online again. For potential OGS adopters, regional product availability turned out as a motivator, signaling substantial growth potential and providing online grocers with strategic opportunities to target this demographic. In light of our research, we offer practical suggestions to online grocery retailers, aiming to overcome barriers and capitalize on key drivers identified in our study for sustained growth in the over-50 market segment.

Keywords Online grocery shopping · E-grocery · Elderly consumers · COVID-19 pandemic · Germany

✉ Simone Braun
simone.braun@hs-offenburg.de

Dunia Osman
dunia.osman99@gmail.com

¹ Department Business, Offenburg University of Applied Sciences, Badstraße 24, 77652 Offenburg, Germany

1 Introduction

Over the years, the significance of e-commerce has grown considerably as a result of the digital transformation. The convenience of online shopping has revolutionized the way people purchase products, with a vast variety of options available at just a click of a button [1]. In addition, the COVID-19 pandemic changed the way people shop and brought remarkable growth to online retailing worldwide as well as in Germany [1–5]. Increased online security in shopping, flexibility, and convenience have come to the fore and led to a boom in e-commerce [6].

As a result, consumer awareness of e-food has grown rapidly worldwide in recent years and has become part of everyday life for many [7, 8]. Responding to this demand, numerous vendors have shifted offerings online, leading to diverse online grocery business models [9]. However, in Germany, reluctance towards online grocery shopping (OGS) persists [7, 10, 11], despite having the largest grocery retail market in Europe [5]. Online grocery shopping in Germany lags behind internationally [7, 8, 11, 12], but exhibits high projected annual growth for the upcoming years [5, 13]. Consequently, this market holds significant untapped potential.

While OGS growth is driven by the under-45 age group [14, 15], Germany's aging population, with the over-50s making up almost half of the population, presents a unique challenge and opportunity [16]. According to the 15th coordinated population projection of the German Federal Statistical Office, the number of people over 65 years will increase by 14% and account for 25% of the total population by 2030; assuming a moderate birth rate, life expectancy, and net migration [17]. Over the years, digital adoption among the over-50s has increased significantly. Since 2018, for example, daily online usage of at least 15 min among 50–59-year-olds has increased by 16%, among 60–69-year-olds by 50% and among the over-70 s by as much as 76% [18, 19]. The 55–64 age group is with 24% already the largest segment of all e-commerce users in Germany, as reported by [20], but seems to be reluctant to buy groceries online. Nevertheless, this demographic shows a growing interest in using digital platforms for their grocery needs and forms an important target group for online grocers [21–23]. Furthermore, OGS could be a viable way for elderly to buy groceries and maintain an independent life when the ability to go to the grocery shop declines [24–27].

Although online grocery shopping has been the subject of research for many years, there is a notable lack of focus on the elderly. For instance, little is known about the change in the grocery shopping habits of elderly individuals over the recent years [24, 25, 28].

Our research, adopting the Theory of Planned Behavior (TPB) [29], addresses this gap by offering insights into how online shopping behavior evolved among German over-50s since 2020. Utilizing a quantitative online survey with 179 respondents, we examine factors like regional food availability, income, and residence influencing OGS habits.

Taken together, we address the following research question:

RQ: *How has online grocery shopping behavior evolved since 2020 among the over-50 age group in Germany? And what factors influence the online grocery shopping behavior of the over-50s?*

The article proceeds with an overview of OGS in Germany and among over-50s in Sect. 2, highlighting a research gap in factors affecting elderly German online grocery shoppers. The literature review aids in forming hypotheses about OGS changes and influencing factors among the over-50s. Section 3 explains our method of surveying with 179 German individuals, aged 50 and above. Next, we present the survey results in Sect. 4, and discuss outcomes and practical implications for online grocers in 5, before we conclude with the study's limitations and propose future research directions in Sect. 5.

2 Literature review

2.1 Online grocery shopping in Germany

Online grocery shopping (OGS) or electronic grocery shopping (EGS) refers to the practice of purchasing food and other essential domestic commodities via e-commerce websites or mobile applications [30]. While e-commerce of various products such as fashion and consumer electronics has been on the rise for several years and has gained significant acceptance among German consumers [31], the online grocery market developed very slowly until the COVID-19 crisis and almost 80% of German consumers have never used OGS before [4, 10, 32]. For example, online grocery retailing held less than 1% of the total grocery retail market share until 2015, and only increased slightly to 1.4% by 2019. This is also considerably weaker in comparison to other European countries such as France or UK with a share of 6% and 7% in the same period [33].

Nevertheless, OGS has recorded a commendable average growth rate of 18.6% over the period from 2011 to 2019 in Germany [32, 34]. Furthermore, consumer acceptance towards online food retailing was progressively increasing [35]. According to a 2018 survey conducted by PwC [36], the typical consumer who intends to buy groceries online in the next 12 months is a male full-time employee, between 35 and 44 years old and has an above-average salary, which is similar to other countries [37, 38]. Further, shelf-stable food items like pasta and confectionery products are particularly favored by consumers. Still, there is a certain degree of hesitation towards purchasing fresh products. Additionally, elderly were rarely buying groceries online [10, 28].

The rather below-average market share in Germany compared to other European countries like UK, Sweden and the Netherlands [8, 37] may be attributed to the country's dense store network and the fact that supermarkets are easily accessible within a few minutes for its inhabitants [12, 39]. Discounters and supermarkets dominate the German grocery market, which is largely controlled by four major brick-and-mortar players: the EDEKA Group, REWE Group, Schwarz Group with Lidl and Kaufland, and ALDI Group. Together, these companies hold a significant 76% share of the total grocery sales volume [40]. With €0.5 billion online sales

revenue in 2022, REWE is the leading online grocery store followed by Flaschenpost (specialized on beverages), Amazon / Amazon Fresh and the frozen food home service bofrost [41].

Over the years, the evolution of OGS has led to the emergence of various types of operations, which can be distinguished from one another according to different criteria such as the delivery option, the ordering and payment modalities or the storage location. Preceding the delivery stage, the goods may be located in a retail store, a warehouse or at the producer's premises. Dederichs & Dannenberg [7] distinguish three business models and three distribution mechanisms for German online grocery retailers. The business models are complementary (hybrid) e-commerce, pure e-commerce, and combined (or cooperating) e-commerce [7, 42]. In the realm of hybrid commerce, commonly known as complementary e-commerce, retailers such as REWE or EDEKA with EDEKA24 possess both a logistics warehouse and a physical branch structure for conducting online retailing operations alongside traditional brick-and-mortar retailing. Even though discounter dominate the grocery market, they do not offer groceries through their online channels (except for wine or some limited drugstore items and pet supply). Online pure players (e.g. Flaschenpost, Amazon Fresh) exclusively offer and sell their products and services via the Internet. Combined or cooperating e-commerce (e.g. Marktschwärmer) includes online marketplaces and jointly operated platforms with different forms of co-operations such as joint procurement, marketing or sales. The delivery mechanisms can be divided into own home delivery logistics, click & collect models, and third party delivery (shipping) models [7, 43]. In the first approach, the grocers handle the delivery themselves (e.g. REWE, Flaschenpost, Amazon or bofrost), while in the second, the customers personally pick up their purchases (e.g. REWE). Finally, the third approach involves a service provider who ships the goods to the customer (e.g. EDEKA with Bringman).

With the COVID-19 outbreak, there were several lockdowns in 2020 and 2021 in Germany. Restaurants and canteens were closed and cooking at home became more important [44, 45]. Gradual easing of the restrictions began end of April 2021 until March 2022. For instance, depending on the incidence number, persons with a vaccination card or proof of recovery and in some cases those with negative polymerase chain reaction (PCR) or antigen rapid test results were allowed to visit local retailers, restaurants, cinemas, etc. again. Grocery shops were excluded from closures and access restrictions during the whole time. But people had to wear FFP2-masks and in some cases the number of visitors allowed in the shop at the same time was limited [44].

The accelerated digitization caused by the outbreak of the COVID-19 pandemic, e.g. in the use of digital payment systems and ordering, as well as the emergence of novel business models, such as quick commerce, have lowered the hurdle for a first order in online grocery shopping. As a result, many people started to explore new shopping channels and order more groceries via the Internet [6, 22]. A study conducted by the digital association Bitkom [6] revealed that 53% of people living in Germany made their first purchase of food online since the outbreak of the pandemic, although grocery shops were not affected by closures and remained open throughout lockdown times. Furthermore, a noteworthy 26% indicated they

occasionally order food online, in contrast to 16% before the pandemic. Studies by [11, 35] confirm this positive effect on German OGS behavior. Also, 29% of the over 65 years old and 17% of the 50-64 age bracket bought groceries online in 2020 [21].

In that course, new providers such as Gorillas, Getir or Flink entered the German market with quick commerce. This business model involves fast delivery services for products ordered online within an hour [46]. In contrast to online pure players and multi-channel retailers, quick commerce strives to fulfill impulsive customer needs and spontaneous buying behavior by offering a comparatively manageable range of products, including consumables such as drinks, snacks, cooking ingredients, drug-store items, and other everyday goods, particularly in large cities and metropolitan areas [47, 48]. As a result, the OGS sales in Germany more than doubled between 2019 and 2021 [4, 32, 48, 49].

However, at €6.09 billion in 2022, online grocery retailing accounts for only a small share of 2.9% of the total German grocery market, which is the largest market in Europe with an annual market volume of over €200 billion [5, 5, 39, 39, 47, 50–52]. The situation is similar in relation to the German e-commerce market, which generated a total sales volume of €84.6 billion in 2022 [5], giving the online grocery market a share of 7.19% for food and beverages. If including the fast-moving consumer goods categories of body care & cosmetics (€ 2.6 billion), drugstore products (€ 0.3 billion), and pet supplies (€ 1.3 billion), the online grocery market share of the total e-commerce retail sales rises to 12.1%.¹

Having a look at the expenditure of Germans, monthly consumer spending on food and beverages totalled €328 per German household in 2022. These product groups accounted for 11.5% of total household consumption expenditure in 2022, which is relatively low compared to the rest of Europe due to rather low food prices [54, 55]. In comparison, the average online revenue per user for food and beverages amounted to €240 for the entire year. But there are differences between the age groups. For example, the 25-44 age group already spends significantly more on OGS [56]. Thus, the typical online grocery shopper in Germany falls within the age range of 25–44 living in urban areas with a medium to high household income, and a medium to high education level [15, 39, 45, 57]. While 65–75 year olds are the least likely to use OGS [15].

To summarize, it can be said that the role of OGS in Germany is relatively small compared to brick-and-mortar grocery retail, especially among the elderly population. The online sector is dominated by well-known supermarket brands, while lacking a presence from discounters [14]. Nonetheless, online grocery retail is currently experiencing the highest growth rate within e-commerce, exceeding that of traditional grocery retailers by a significant margin, albeit at a lower pace since 2022 due to subdued demand [5].

¹ According to the German Federal Cartel Office [53] grocery retailers are those who generate about 80% of revenue through food, including beverages, and through non-food products, also known as near-food, including hygiene and body care products, detergents and cleaning agents, pet food, and household goods [53].

2.2 Drivers and barriers for German online grocery shoppers

Online grocery shopping has been a focus of study for several years. Various theoretical frameworks have been employed to describe OGS behavior and underlying factors for adoption, including the Technology Acceptance Model (TAM) [58], Unified Theory of Acceptance and Use of Technology (UTAUT) [59], and Theory of Planned Behavior (TPB) [29, 60] as the three most commonly used ones [61]. Factors that influence OGS adoption throughout different countries and contexts include perceived risks, usefulness, and ease-of-use, individual attitudes, social norms, but also framing conditions such as age, gender, and experience.

Similar to other countries [38, 62–64], German online grocery shoppers are characterized by a high affinity for digital channels and tend to be young families who rather live in urban areas and have a medium or higher income [34, 45, 65, 66]. Main drivers for buying online for German consumers—like consumers worldwide [61, 67, 68]—are perceived usefulness, convenience/comfort, and economical aspects such as saving time and money. People do not need to leave the house. OGS can save money by eliminating impulse purchases or save time by eliminating the trip to the local store. Thanks to the home delivery option provided by OGS and the independence from opening hours when ordering, consumers are relieved of the inconvenience of physically visiting a brick-and-mortar store for their desired products. In addition, there is no need to wait at the checkout and search for different products in the store, which saves a lot of time, being specifically a driver for families or full-time employees [10, 65, 68]. German consumers use OGS because of greater product availability and variety, especially of speciality products and brands. Compared to brick-and-mortar stores, online grocers usually have a larger assortment and a more extensive product range. Many also want to reduce stressors such as stress and hassle when shopping in-store (e.g. with small children) or the physical efforts of carrying heavy bags. During the pandemic, consumers preferred to order online, for example, to avoid crowds in physical stores and thus reduce the risk of infection. But also for spontaneous purchases, such as when a certain cooking ingredient is missing, people use OGS. Another driver is transparency. Thus, it is easier and faster to access information online about origin, producer and ingredients or to compare prices [10, 11, 39, 68–70]. Overall, individuals who engage in OGS tend to be more technology and internet savvy and open to innovation [10, 65, 68, 71].

Therefore, missing digital literacy and experiences as well as technology anxiety are barriers, hindering OGS adoption [10, 65, 68, 71]. Besides, one of the most common barrier why German consumers do not order food online is the lack of opportunity to check the quality of the products, indicating a significant emphasis on the tactile and olfactory experience but also a lack of trust in the product quality. This is particularly true for perishable products, such as fruits and vegetables, which consumers prefer to inspect personally prior to purchase [10, 11, 22, 72]. There is also a lack of trust in the e-grocer regarding privacy and data security [68]. Many prefer the personal contact and the social interaction and enjoy the atmosphere created by pleasant music, lighting and shop design in-store [73]. As a result, the shopping experience of OGS is perceived as less attractive. Additional hindering factors are high density of supermarkets with comparable extended opening hours, so that

together with the inconvenience of higher prices, high delivery costs or high minimum order fee the rather price-sensitive German consumers refrain from OGS [39]. German consumers lack access to their discounters as they do not sell groceries online. Additionally, rural areas have limited online grocery options, making it more difficult to order groceries online for these consumers [3, 39]. Other aspects limiting the OGS experience are limited delivery times, waiting for deliveries, or orders not being filled appropriately (e.g. incomplete delivery) [39]. Furthermore, sustainability concerns related to packaging waste and CO₂ and greenhouse gas emissions, let consumers abandon the online cart [12, 22, 68].

2.3 Online grocery shopping among the over-50s

Germany, like other countries, is facing demographic ageing. While the proportion of the elderly demographic is experiencing a steady increase, the number of younger people is declining significantly. According to the German Federal Statistical Office “the number of people at retirement ages (67 or over) will grow massively in the 2020s and 2030s” [74]. This trend can be attributed to the rising life expectancy and, at the same time, the decline in the number of births. Although there has been a rejuvenation within the German population over the past decade due to immigration and an increasing birth rate, every second person is currently older than 45 years, and in terms of age groups, the baby boomer generation born between 1955 and 1970 dominates in particular [75]. Overall, the over-50s make up nearly half of the German population at about 45% [16]. Thus, the over-50s form an interesting target group for various businesses offering consumer goods and services [8, 76].

There exist numerous designations for the demographic of elderly consumers, including *Best Agers*, *Silver Agers*, *Golden Agers*, *Senior Citizen*, or *Generation 50plus*. However, it is to be noted that this is not a homogeneous target group and therefore requires further differentiation based on distinct needs. Thus, in the field of marketing to elderly, there exist a diverse range of typologies which seek to make age more comprehensible and controllable [28, 77–80]. Pompe [79] divides the 50-plus age group into three core segments: The *Master Consumers* segment, oriented towards those aged 50 to 59, comprises active, high-spending, mobile and experience-oriented individuals who are also fun-loving, receptive to novelty and reject age-related stereotypes. The *Maintainers*, the second segment, consist of individuals aged 60 to 69 who are financially stable and physically/mentally healthy, rejecting traditional elderly role models. The *Simplifiers*, the last segment, target the over-70s, who exhibit more traditional and conservative values. Oeser et al. [28] have delineated a range of segmentation criteria for the elderly population from existing literature. These include chronological age, perceived/cognitive age, discrepancy age and functional age as well as lifestyles and psychological aspects like attitudes and values. They further investigated elderly German grocery shoppers and, based on a cluster analysis, have put forward seven distinct groups that diverge in their motivations for grocery shopping in general: convenience, indifferent, leisure, assistance-oriented, no frills, product-oriented and service-oriented senior German grocery shoppers; with the first group being the most interested in OGS.

Several studies worldwide found that as people get older, they are less likely to buy groceries online [38, 62, 81–83]. Table 1 provides an overview on selected international studies that provide demographic insights specific to the over-50s. In the Czech context, only one out of ten consumers aged 56 and above showed willingness to purchase groceries online [38]. On the other hand, those who engage in OGS are more likely to persist in doing so in the future, irrespective of the pandemic [62, 24] highlight the importance of the in-store experience and social interaction beyond mere food buying activity. Thus, “click & collect” was preferred to home delivery among Swedish elderly. The authors expect elderly to continue shopping online as well as in stores in the future. As shopping groceries online requires new digital competences, user-friendly webshop interfaces and navigation support that emulates the physical shopping experiences are crucial. Similarly, inspirational functions, e.g. for new recipes or food and product discoveries, are also important. In the Norwegian context, elderly choose OGS because of situational factors like health condition, mobility, and proximity to store, while cost, delivery time, and social interaction have less influence [26]. Only a few of the consumer over-60 in Finland adopted OGS due to the pandemic. But those having concern about their health were slightly more inclined to be adopters compared to others [63]. In contrast, OGS increased under pandemic conditions in Switzerland among elderly, particularly those aged 70–79 years [83]. Delivery time is also less crucial for the elderly compared to younger age groups. But overall, Swiss elderly have a lower positive attitude towards OGS. Regarding mobility and proximity to store, retired (aged 60+) Canadians car drivers had a higher probability of OGS compared to those who walk, go by bike or public transport. However, some OGS adopters experienced a tendency to forget things or make mistakes and had worries about finding alternatives for out-of-stock items, as well as the need for planning ahead [27].

There are only a few studies, particularly academic ones, that provide insights on the OGS among the over-50s in Germany (see Table 2). von Gizycki and Pohlmann [65] analyzed the digital and in-store grocery shopping behavior in Germany and identified three customer segments regarding usage and acceptance. They concluded that OGS acceptance is not fundamentally attributable to the age. If consumers show technology acceptance and familiarity, the personal benefits are decisive for OGS adoption. However, most of the over-50s participants were part of the conservative technophobe cluster rejecting OGS. Similarly, Deichner et al. [84], consider the 60+ age group to be the most likely traditional in-store shoppers. Nevertheless, consumer shopping patterns are undergoing a transformation. For example, a third of the over-50s say they are passionate online shoppers. However, only a few have ordered groceries online more frequently since 2020. The results of [45] are slightly different, with 21% of regular older online shoppers buying groceries online and almost half doing so several times a month. Still, there is a general openness to use OGS and many of the over-50s who have not yet bought food online said they could imagine to do so in the future [10, 39]. Shaw et al. [85] were able to confirm convenience and perceived usefulness as positive influencing factors for continuing OGS not only among the younger Germans but also among the over-50s. Lack of time and avoiding crowds in brick-and-mortar stores are the two main reasons people

Table 1 Selected international OGS studies providing over-50s specific insights

Author(s) (year)	Geographical focus	Method	Sample	Over-50s specific/demographic insights
Bezirgami and Lachappelle (2021) [27]	Canada	Qualitative interviews	N = 61; 100% ≥60 years	26.2% used OGS at least once but didn't really wanted. Aspects for reduced willingness were concerns about product quality, forgetting things, making mistakes, finding alternatives for out-of-stock items, planning ahead, or missing social interaction. Car drivers are more likely to adopt OGS
Bartok et al. (2021) [38]	Czech Republic	Online survey	N = 170; 5.8% ≥55 years	1 out of 10 elderly participants used OGS. OGS adopters are most likely male, aged 27–45, and have a higher income
Bauerova (2021) [23]	Czech Republic	Panel surveys & online survey	N = 877 in 1st survey, N = 773 in 2nd, and N = 195 in 3rd; 27.1% ≥52 years in 1st survey and 19.8% and 8.2% ≥55 years in the latter two surveys	COVID-19 accelerated OGS acceptance as well as frequency among elderly
Jensen et al. (2021) [62]	US	Online survey	N = 2000; responsible for shopping groceries for their household aged ≥18; 31.4% aged 55–89	Age negatively affects OGS adoption. Elderly OGS adopters are more likely to continue. Primary grocery shoppers are female. Full-time employment, higher education level or children increase OGS. No influence of low income

Table 1 (continued)

Author(s) (year)	Geographical focus	Method	Sample	Over-50s specific/demographic insights
Eriksson and Stenius (2022) [63]	Finland	Online survey	N = 2568; 22.1% ≥60 years	8.8% of the elderly adopted OGS due to the pandemic. Female gender and health concerns positively affects OGS adoption among 45+ years old. OGS adopters are typically aged ≤45, living in the capital region, having higher household size and higher income
Gomes and Lopes (2022) [82]	Portugal	Online survey	N = 358; OGS adopters aged ≥18; 24.7% ≥41 years and 64.5% aged 18–30	Younger age, higher education level, and higher income positively influence OGS experience. Higher satisfaction with OGS increases future OGS intention
Hansson et al. (2022) [24]	Sweden	Qualitative telephone interviews	N = 38; 100% aged 69–97	“Click & Collect” was preferred to home delivery due to social interaction. User-friendly web-shop interfaces emulating physical shopping experiences as well as inspirational functions found to be crucial
Kvalsvik (2022) [26]	Norway	Qualitative telephone/video interviews & online panel with online questionnaire	N = 9 interviews & N = 111 panel participants; 100% aged 62–92	In-store grocery shopping is preferred. Situational variables like health condition, mobility, proximity to store, cost, delivery time, and social interaction increase elderly’s willingness to OGS
Yap et al. (2022) [25]	Malaysia	Paper-and-pencil & online questionnaire	N = 302; 100% ≥60 years and OGS non-adopters	Physical mobility, perceived usefulness and ease of use affect elderly’s OGS use intention

Table 1 (continued)

Author(s) (year)	Geographical focus	Method	Sample	Over-50s specific/demographic insights
Meister et al. (2022) [83]	Switzerland	Stated choice experiment with online survey	N = 1009; buying groceries for themselves; 18.0% 50–59 years, 18.8% 60–69 years, 7.9% 70–79 years, and 1.0% ≥80 years	Increased OGS frequency under pandemic conditions esp. among 70–79 age group. Lower OGS adoption among elderly in comparison to younger age groups. Delivery time is less crucial for retired people. Higher income has a positive effect on OGS adoption

Table 2 OGS studies in Germany providing over-50s specific insights

Author(s) (year)	Geographical focus	Method	Sample	Over-50s specific/demographic insights
<i>Academic studies</i>				
Seitz et al. (2017) [10]	Germany	Paper-and-pencil questionnaire	$N = 412$; 8% ≥ 65 years	The group of ≥ 65 years and familiar with online shopping shows interest in OGS
Oeser et al. (2019) [28]	Germany	Focus group interviews & F2F-/Online survey	$N = 36$ in focus groups, $N = 1288$ in survey; 100% ≥ 65 years	OGS is rarely used. Segment of convenience shoppers are most interested in OGS
von Gizycki and Pohlmann (2021) [65]	Germany	Online surveys	$N = 496$ in total; 11.1% ≥ 56 years	OGS acceptance not fundamentally attributable to the age. Assuming basic technology acceptance and familiarity, the personal benefits are decisive if outweighing the risks. Most % ≥ 56 years olds are part of the conservative technophobe cluster rejecting OGS
Shaw et al. (2022) [85]	Germany, Canada, US	Online survey	$N = 1494$ in total; $N = 460$ German consumers; 25.4% ≥ 57 years	Convenience has an effect on perceived usefulness and usefulness positively influences continuing OGS among elderly Germans
<i>Non-academic studies</i>				
Bitkom (2020) [21]	Germany	CATI ¹	$N = 1003$; Internet users ≥ 16 years	29% of the ≥ 65 year old and 17% of the 50-64 age bracket bought groceries online during COVID-19 pandemic

Table 2 (continued)

Author(s) (year)	Geographical focus	Method	Sample	Over-50s specific/demographic insights
Accenture and GfK (2022) [66]	Germany	Consumer panel FMCG	30,000 households	OGS spending increased significantly by 68% among “young families” (≤39 years) and by 62% among “retired families” (≥50 years) from 2019 to 2021. Compared to total annual expenditure; the “older singles” (≥60 years) had the largest rise in OGS spending of 54%, but together with “older families” (≥50 years and employed) also the lowest part
Deichner et al. (2022) [84]	Germany	CAWI ²	N = 1015; 19.4% aged 50–59, 13% aged 60–69, and 4% ≥70	The 60+ age group are most likely traditional in-store shoppers. 29% aged 50–59 and 25% aged 60–69 are passionate online shoppers. Only 9% aged 50–59, 5% aged 60–69, and 4% aged 70+ used increased OGS since the beginning of the pandemic
dpd group (2022) [45]	Germany and 20 other European countries	Online survey	N = 23,394 in total; N = 1500 German online shoppers from 18 to 70 years	7–9% of regular e-shoppers aged ≥55 buy groceries or fresh food/beverages at least once a week and 31–40% 2–3x a month. Most use online shopping for more than 5 years

Table 2 (continued)

Author(s) (year)	Geographical focus	Method	Sample	Over-50s specific/demographic insights
Thedens and Hachibiti (2022) [39]	Germany	Online survey	$N = 2500$; from 16 to 65 years	For the 55–65 age bracket: 24% are OGS adopters spending €20–€100 weekly; 41% of the non-adopters intend to use OGS in the future; Lack of time and avoiding crowds are the main drivers for OGS; Most prefer home delivery and click and collect at least; Most live in smaller cities or in the countryside, where there are fewer OGS offerings

¹Computer Assisted Telephone Interviews²Computer Assisted Web Interviews

between 55 and 65 purchase groceries online, with a majority of participants preferring the home delivery option and least demand for the click & collect option. Only, Best Agers are most likely to live in smaller cities or in the countryside, where there are fewer OGS offerings [39].

Taken together, while numerous studies have investigated the overall OGS behavior of German consumers, most provide only limited demographic insights and no specific findings for the over-50s age group, as the selection of academic and non-academic studies in Table 3 shows. Often, this age group is underrepresented in the study group, even though it makes up 45% of the German population. Thus the generation over 50 has yet to be adequately explored. Specifically, there is insufficient knowledge about how the OGS behavior has evolved throughout the recent years shaped by accelerated digitization and about the influencing factors. As a result, the following research hypotheses are proposed.

As studies show [21, 45], ordering groceries online has increased since 2020 in Germany. Particularly among the more senior population group the offer from online grocers got more popular [21, 39, 45], which leads to the assumption that:

H1: *The willingness to order more groceries online has increased since 2020 among a majority share of people over age 50.*

Several studies worldwide have revealed that the older people get, the less likely they are to buy their groceries online. The elderly are less familiar with technology and less active online than younger generations [24, 37–39, 62, 65, 82, 84, 86, 87]. This leads to the following hypothesis:

H2: *The experience with OGS among the over-50s decreases with increasing age in this group.*

A number of studies have found that customers have concerns regarding the food quality and prefer to “touch and feel” products on site rather than ordering groceries online [11, 22, 27, 38, 70, 72, 88]. To that end, we assume:

H3: *For a majority of those over 50, not being able to check groceries beforehand is a barrier to OGS.*

Studies suggest that regional products have gained more importance among consumers [3, 27, 71, 84, 89]. However, it is unclear if this trend applies to consumers over the age of 50, as age differentiation was not considered.

H4: *For a majority of the over-50s the offering of regional products is an incentive to buy groceries online in the future.*

Additionally, literature indicates that individuals with higher income tend to purchase groceries online more frequently [10, 24, 38, 45, 63, 82, 83, 86, 90]. Nevertheless, there is a dearth of information specific to the Generation 50plus.

H5: *Individuals over 50 with lower monthly household income tend to order food online less frequently.*

The elderly often live in rural areas outside delivery zones of online grocery retailers, limiting their ability to order groceries online [3, 27, 39, 63]. Thus, we form the following hypothesis:

H6: *The frequency of online grocery orders depends on the population size of the target group’s place of residence.*

Table 3 Selected OGS studies in Germany without over-50s specific insights

Author(s) (year)	Geographical focus	Method	Sample	Over-50s specific/demographic insights
<i>Academic studies</i>				
Frentz (2020) [68]	Germany, US	Paper-and-pencil & online survey	$N = 388$; $N = 239$ German consumers; 30.8 years old on average	N/A
Piroth et al. (2020) [12]	Germany	Expert interviews	$N = 20$	N/A
Brüggemann and Olbrich (2022) [35]	Germany	Household panel	$N = 17,766$ households	N/A
Brüggemann and Pauwels (2022) [71]	Germany	Household panel and survey data	$N = 19,625$ households on average per month	OGS households are significantly younger and smaller with fewer children and have a lower income than pure in-store shopping households
Gruntkowski and Martinez (2022) [11]	Germany	Online survey	$N = 402$; 19.2% aged 50–65 and 69.4% aged 20–35	N/A
<i>Non-academic studies</i>				
Oliver Wyman (2017) [72]	Germany	Survey	$N = 1003$; responsible for shopping groceries for their household, primarily from 18 to 49 years	N/A
PwC (2018) [36]	Germany	Survey	$N = 1000$; 15% of online shoppers and 20% of in-store shoppers ≥ 55 years	The typical consumer who intends to buy groceries online in the next 12 months is a male full-time employee, between 35 and 44 years old and has an above-average salary
Bitkom (2019) [70]	Germany	CATI ¹	$N = 1054$; online shoppers ≥ 14 years	N/A

Table 3 (continued)

Author(s) (year)	Geographical focus	Method	Sample	Over-50s specific/demographic insights
Bitkom (2021) [6]	Germany	CATI ¹	N = 1048; online shoppers ≥ 16 years	N/A
KPMG (2021) [22]	Germany, Austria, Switzerland	Online survey	N = 3152 in total; N = 1.050 German consumers of which 39% aged 56–89	Regular or occasional OGS increases with net income

¹Computer Assisted Telephone Interviews

3 Methods

3.1 Procedure and sample

For this study we collected data through an online survey created with LamaPoll survey software, as online surveys are an established and frequently used method in OGS studies (see Tables 1, 2, and 3). Online surveys are resource-efficient due to self-administration. They are discreet and anonymous for the the participants and can capture not directly observable past behavior and subjective experiences [91]. The survey was conducted from November 7 to November 21, 2022. During that period, a limited number of precautionary measures remained enforced in Germany due to the pandemic, such as wearing FFP2-masks in public transport and medical offices. Additionally, masks and tests were mandatory in hospitals and care facilities [44]. Over 90% of those over 60 years had received at least one dose of COVID-19 vaccine [92].

For comparability, the survey was based on a standardized written questionnaire, which consisted mainly of closed and semi-open questions. We conducted a pre-test to ensure comprehension of the questions among the participants. We used convenience sampling and distributed the link via social networks and e-mail. In addition, we asked participants to forward the survey to further potential participants. People living in Germany who are over 50 years old and already use the Internet were eligible to take part. All participants were informed about the study's purpose and provided their informed consent. A total of 213 individuals took part with 179 respondents fully completing the questionnaire. 34 questionnaires had to be excluded form the analysis due to incomplete responses. The data were statistically analyzed with the IBM SPSS v29 software.

The characterization of the sample is described in Table 4 and set in relation with DeStatis data from the German Federal Statistical Office [16, 54, 93]. A total of 29% of the participants were male and, consequently, about 71% were female. The disproportionate representation of females may be attributed to the notion that in Germany, females tend to assume a greater degree of responsibility with regard to grocery shopping than their male counterparts, hence establishing a stronger connection with the subject matter at hand [10, 94]. In this manner, the composition of our sample reflects the findings of previous studies [10, 11, 37, 82, 94]. Most participants were between 50 and 59 years old (70%), whereby participants aged between 60 to 69 account for 28%. Participants over 70 years old were the least represented (2%). In the context of this empirical study, it has proven difficult to reach more people over 70 via the Internet. Overall, 54% of the respondents have a monthly household income of more than €3,000 and more than one third of the respondents reported an income ranging from €1,501 to €3,000. This shows that the 50-plus age group is financially stable and holds considerable purchasing power [95]. Almost half of the respondents live in rural areas (49%) and about 34% are from a small or medium sized town. Only 17% currently live in a large city. This is going inline with [39].

Table 4 Statistics of the sample

Characteristics		Total (<i>n</i>)	Percent (%)	DeStatis [16, 54, 93]
Gender	Female	127	70.9	53.1%
	Male	52	29.0	46.9%
	Diverse	0	0.0	–
Age	50–59	124	69.3	34.0%
	60–69	51	28.5	29.9%
	<70	4	2.2	36.1%
Monthly household income	<450 €	3	1.7	ϕ 3,669 €
	451–1500 €	13	7.3	
	1501–3000 €	66	36.8	
	>3000 €	97	54.2	
Place of residence	Large city	30	16.7	19.6%
	Small to medium town	61	34.1	56.4%
	Village or countryside	88	49.2	24.0%
Have you ever purchased groceries online?	Yes	65	36.3	
	No	114	63.7	

3.2 Questionnaire and measures

We published the questionnaire in German and started with an explanation of the background of the study and an assurance of confidentiality followed by an informed consent form. Afterwards, the structure of the questionnaire was divided into two parts with a dichotomous variable at the beginning, asking the participant whether they had bought groceries online in the past. Figure 1 details the structure of the questionnaire. In total there were 17 mandatory questions including four questions for demographic differentiation (gender, age, income and place of residence). There were three semi-open questions, with the additional response category designated as “Other” to ensure that further individual aspects are taken into account. Where feasible questions and the corresponding answer options were derived on the basis of the existing literature.

4 Results

4.1 Descriptive analysis of OGS adopters

Of the entire pool of 179 participants, approximately 36.3% affirmed that they have previously ordered groceries via the Internet, i.e. being the OGS adopters, and were subsequently presented with an additional six questions. They were queried about their motivations for purchasing groceries online. The survey allowed for multiple responses and included eight predetermined answer options (see

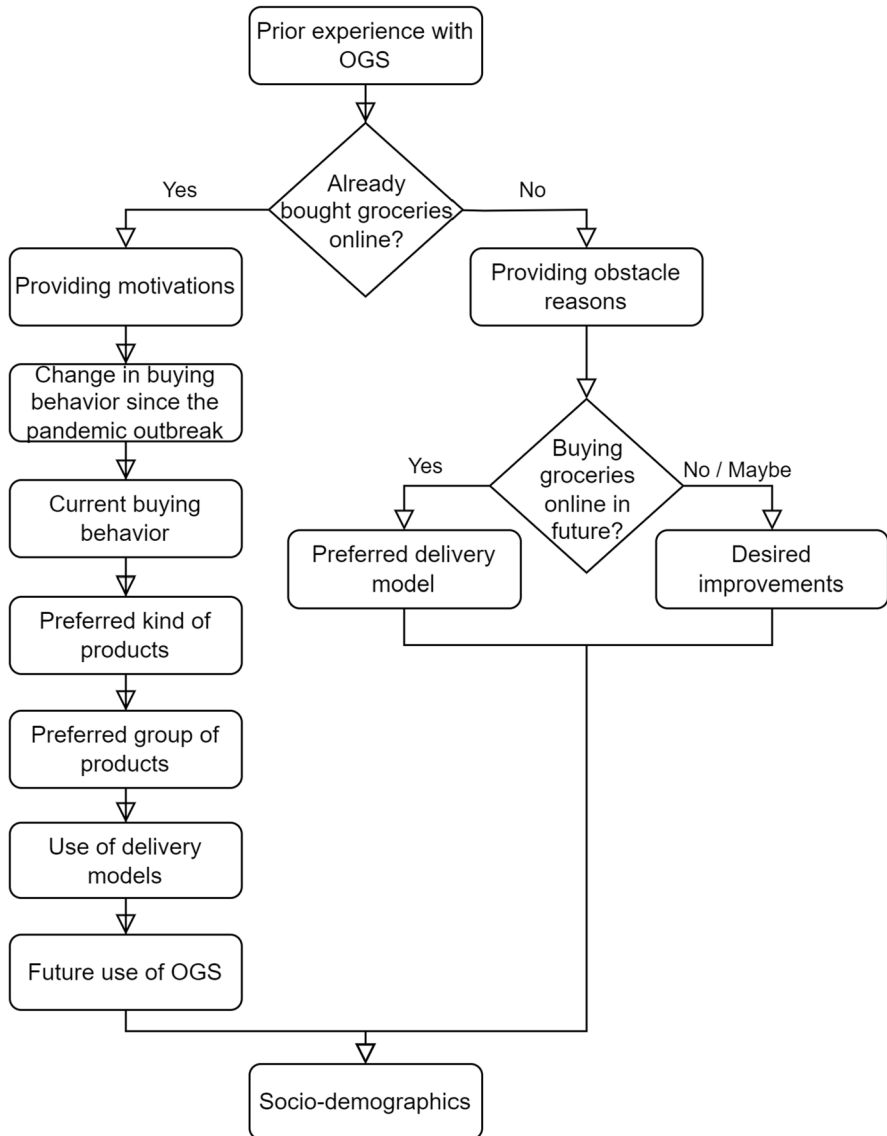


Fig. 1 Structure of the questionnaire

Table 5 and 6), as well as an open-ended “other” category. Nearly half of the OGS adopters over 50 years consider home delivery as the determining factor when purchasing groceries online. For 38.5% there are other reasons that can be grouped into the categories exclusivity and regionality. The respondents stated that they head for OGS mostly due to the availability of exclusive products, such as a particular variant of dates or delicacies from other parts of Germany, which are not easily accessible at nearby physical stores or are only vending overseas.

Table 5 OGS adopters—statistics of those who purchased groceries online, part I, n=65

Characteristics	Total (n)	Percent (%)
Which of the following aspects have motivated you to order groceries online?	65 (136 answers)	100
Home delivery	31	47.7
Other	25	38.5
Greater product variety	18	27.7
Convenience	15	23.1
Curiosity	13	20.0
Independence from opening hours	11	16.9
Safeguarding against COVID-19	8	12.3
Shopping without waiting time	8	12.3
Lower prices	7	10.8
Have you ordered more groceries online since the COVID-19 outbreak?	65	100
No, continued grocery shopping mostly in-store	50	76.9
Partly, bought certain groceries online, other exclusively in-store	12	18.5
Yes, COVID-19 pandemic was the trigger for more OGS	3	4.6
<i>How do you currently buy groceries?</i>	65	100
Exclusively in-store	26	40.0
Mostly in-store, partly online	38	58.5
Mostly online, partly in-store	1	1.5
Exclusively online	0	0.0
<i>How often do you currently order groceries online?</i>	65	100
Several times per week	0	0.0
Several times per month	10	15.4
Several times per year	33	50.8
Not at all	22	33.8

Additionally, for many regional food is considered important and influences their online purchasing decisions. Furthermore, almost 28% stated that they were motivated to shop groceries online due to the greater variety of products offered by online grocery retailers compared to brick-and-mortar stores. Other aspects include convenience at 23.1% and curiosity at 20%, which prompted participants to place their grocery orders online. The importance of safeguarding against COVID-19, along with shopping without waiting times and lower prices, is not a major factor in OGS for the target group, as shown by the relatively small percentage of 12.3%.

We further examined whether people have increased their online food ordering since the COVID-19 outbreak. Most (76.9%) still prefer shopping groceries in-store, with only a small percentage of 4.6% citing the pandemic as a reason for OGS. 18%

Table 6 OGS adopters—statistics of those who purchased groceries online, part II, n=65

Characteristics	Total (n)	Percent (%)
What are your preferred type of goods when buying groceries online?	65 (80 answers)	100
Non-refrigerated, shelf-stable products	57	87.7
Fresh products	15	23.1
Frozen foods	5	7.7
Refrigerated products	3	4.6
Which of the following foods do you mainly order online?	65 (141 answers)	100
Spices and cooking oils	24	36.9
Drinks	19	29.2
Coffee and tea	18	27.7
Grain products (rice, pasta, cereals, etc.)	18	27.7
Sweets	16	24.6
Fruits and vegetables	14	21.5
Salty snacks (chips, pretzel sticks, etc.)	9	13.8
Diary products	6	9.2
Prepared foods	6	9.2
Frozen foods	4	6.2
Bakery products	4	6.2
Fish and meat	3	4.6
Which of the delivery models have you used?	65	100
Home delivery	57	87.7
Click & Collect	3	4.6
Both	5	7.7
Are you considering shopping most of your groceries online in the future?	65	100
Yes	2	3.1
No	55	84.6
Maybe	8	12.3

have changed their purchasing behavior for certain goods, but still weigh the benefits of online versus in-store shopping. When asked about their current grocery shopping practices, nearly all of the 65 adopters disclosed that they primarily or solely purchase goods in-person. However, some of the 58.5% who primarily shop offline also buy groceries online. Therefore, it can be inferred that many who have previously shopped online continue to do so to some extent.

When asked for the frequency of OGS, a third of the participants responded that they currently do not engage in such activities. Additionally, 50.8% of respondents reported purchasing their groceries online several times a year, while a mere 15.4% make such purchases multiple times per month. It is worth noting that none of the 65 participants opted for weekly ordering. These figures show that at the time of

the survey only a small minority exclusively or very frequently shops for groceries online. Despite the experience of OGS and the pandemic, a considerable number of individuals above the age of 50 have not adopted the practice of regularly using OGS, and it remains an uncommon occurrence for the majority.

We further wanted to know, what kind of products the participants preferably buy online. Participants were presented the answer options of fresh, refrigerated, frozen, and non-refrigerated shelf-stable products as multiple choice. A large majority (87.7%) prefer non-refrigerated, shelf-stable products. At 23.1%, fresh products is cited second most often, and for the remaining two options there is the least interest. Going into depth of the product groups, spices/cooking oils are purchased the most, accounting for 36.9%. Drinks follow with 29.2%, while coffee/tea and grain products both have 27.7%. Sweets is also at the top with a share of 24.6%. These five most highly ranked product groups are basically non-refrigerated, shelf-stable products. The fruit and vegetable category had a surprisingly high share, despite shelf-stable items being more popular. 21.5% of participants mainly purchase these items online. Frozen goods, bakery products, fish, and meat are bought online least often.

In terms of delivery model, home delivery is the most popular choice. 87.7% of participants have used this sales model, while only 4.6% prefer exclusively self-pickup in the store. This is not surprising as home delivery is the primary reason for ordering groceries online.

Lastly, participants who previously ordered groceries online were asked if they would do most of their grocery shopping online in the future. The majority (about 85%) cannot imagine doing this, while 15.4% are considering it. This highlights that traditional in-store grocery shopping is strongly ingrained in consumer behavior, but a significant number are willing to change their habits.

4.2 Descriptive analysis of OGS non-adopters

According to the survey data, a significant portion of the 179 participants, namely 63.7%, have yet to engage in OGS, i.e. they are the OGS non-adopters. Therefore, we asked about the reasons for obstacles preventing them from doing so. The participants were given multiple choices to select from and had the opportunity to express their personal reasons using the “Other” option. The primary objection expressed by the group of non-adopters, accounting for 76.3%, pertains to their lack of interest in OGS (see Table 7). This indicates that although the over-50s have arrived in the digital age and Internet use has increased, they are reluctant to embrace new trends due to a lack of experience and adopt a negative attitude. The subsequent reason, closely trailing at 68.4%, is attributed to the inability to physically examine the products before purchase. Additionally, about 52% of respondents expressed their lack of confidence in the quality and freshness of the merchandise. These findings suggest that the OGS has not been successful in gaining the essential trust of most participants, underscoring the need for significant efforts to change their perceptions. A missing shopping experience and too high delivery costs is an obstacle for 21.1% respectively 16.7%. A higher minimum order value and a limited delivery area do not represent major barriers to purchase groceries online for the participants. Furthermore,

Table 7 OGS non-adopters—statistics of those who have not yet engaged in OGS, n=114

Characteristics	Total (n)	Percent (%)
Which of the following aspects have prevented you from ordering groceries online?	114 (301 answers)	100
No interest in OGS	87	76.3
No prior product examination possible	78	68.4
Lack of trust in quality and freshness of products	59	51.8
Missing shopping experience	24	21.1
Delivery costs too high	19	16.7
Minimum order value too high	14	12.3
Other	13	11.4
Residential area not delivered	7	6.1
Can you imagine ordering groceries online in the future?	114	100
Yes	8	7.0
No	71	62.3
Maybe	35	30.7
Which of the following delivery models would you use?	8	100
Home delivery	6	75.0
Click & Collect	0	0.0
Both	2	25.0
How should the offer be designed so that you buy food online?	106 (288 answers)	100
Offering regional products	73	68.9
Meeting quality expectations	68	64.2
Low minimum order value	38	35.8
No delivery costs	37	34.9
Comparatively reasonable prices	26	24.5
Comprehensive assortment	25	23.6
Other	21	19.8

we divided the responses categorized as 'Other' into two distinct classifications, namely sustainability and endorsement of local vendors. Given that online shopping generates additional packaging waste and contributes to environmental pollution through transportation, a considerable number of individuals are hesitant to engage. This demonstrates that the target group considers sustainability as an important aspect and this greatly influences their buying decisions. Additionally, they prefer to purchase from local vendors to contribute to the promotion of local trade.

Regarding the participants' future shopping intention, only a small percentage of the non-adopters (7%) expressed their willingness to use OGS. In contrast, it is evident that a substantial majority of the respondents (62.3%) are unwilling to embrace this particular sales channel in the foreseeable future. Nevertheless, 30.7% are open to the idea if needed, indicating a potential interest in incorporating digital grocery shopping into their lives.

Those eight individuals who indicated their interest in purchasing groceries online were subsequently queried about their preferred delivery options. The findings indicate that, in comparison to individuals who have previously used OGS, 75.0% would opt for both home delivery and click & collect, while the remaining 25.0% lean towards home delivery solely.

We inquired about the necessary actions to persuade participants who are hesitant to buy groceries online. In light of the various options available, it becomes evident that offering regional products (68.9%) and meeting quality expectations (64.2%) could greatly impact purchasing decisions. A low minimum order value and no delivery costs are appealing to 35.8% and 34.9% of participants. This shows, that grocery online retailers can attract many customers in this age group by having low additional costs. A quarter of the respondents want a wider range of products. Around 20% of participants suggested other improvements. The improvement wishes can be divided into two main categories: lack of interest and environmental consciousness. Some indicated OGS is not an option at all, even with adapted offering or services. Others stated a more environmentally friendly concept would increase their willingness to buy. The following suggestions were made here: (a) Guaranteeing short transportation distances, (b) Offering local and certified organic food, (c) Supporting local suppliers like farm shops, and (d) Using sustainable or reusable packaging.

Overall, it is evident that certain individuals who have not yet embraced OGS are unwilling to reconsider their stance in the future. This suggests that, aside from the previously mentioned barriers like missing interest or trust in quality, they possess a fundamental resistance to change and find comfort in familiar practices. However, a considerable proportion of non-adopters are also receptive and eager to explore new trends, thereby placing high expectations on the OGS experience, including factors such as high-quality products, a diverse selection, and an environmentally sustainable approach.

4.3 Hypothesis testing

In the following, the data obtained is used to test the developed hypotheses. To that end, the null hypothesis (H_0) was established for each hypothesis in order to test the hypotheses and significance tests were conducted with the significance level $\alpha = .05$. As testing procedures, a Binominal test was used for H_1 , H_3 and H_4 and a Spearman rank correlation was used for H_5 and H_6 due to ordinal scales. The correlation strength is determined using the classification system developed by Cohen [96]. There are three categories: weak effect (0.1), medium effect (0.3), and strong effect (0.5). For H_2 , cross-tabulation was used (nominal scale) and Fisher's exact test. The Fisher's exact test had to be applied instead of the Chi-squared test because a prerequisite for performing the Chi-squared test is that the expected frequencies may be less than five for a maximum of 20% of the categories which was not given for this specific case.

Starting with hypothesis *H1*, only 15 out of 65 OGS adopters agreed in support of the hypothesis (see Table 5). Since the respondents have largely maintained their shopping habits, the pandemic has not led the majority to increased use of OGS. *H1* cannot be supported at the .05 significance level (rejection interval for *H1* equals [40, 65]).

The potential connection between age groups and experience with OGS among all participants was examined using the cross-tabulation method and the Fisher exact test. After comparing the expected and actual frequencies, it was found that there were no significant differences or deviations within the age groups. Additionally, the results of Fisher's test indicated that there was no significant correlation between the age groups and experience in OGS ($p = .392$). *H2* can therefore not be supported.

The examination of food products before buying them, i.e. the "touch and feel", is an important factor for consumers, as they want to personally assess the quality of the product, resulting in a substantial obstacle for OGS [11, 22, 72, 88]. Our findings reveal that among non-adopters over the age of 50, the option "No prior product examination possible" was mentioned as an aspect preventing 68.4% of them from utilizing OGS (see Table 7), thereby confirming *H3* at the .05 significance level (rejection interval for *H3* equals [67, 114]).

The regional origin of food plays an important role for the respondents and regional products are most demanded or desired. For almost 70% of the non-adopters, offering these products is a possible motivation for ordering food online (see Table 7). *H4* can therefore be supported at .05 significance level.

For testing *H5*, Spearman's rank correlation coefficient was used to determine if there is a potential connection between monthly household income and the frequency of ordering groceries online among the OGS adopters, particularly if individuals over 50 with lower income order groceries online less often; the coefficient is $-.033$, indicating a weak negative correlation according to Cohen [96], and the p-value of the significance test $p = .794$ is not significant, leading to the rejection of *H5* and negating any discernible relationship.

Spearman correlation was also utilized to test *H6*, examining the connection between participants' place of residence and frequency of OGS among adopters, particularly if larger population size results in more frequent OGS among the study group; results showed a weak positive correlation ($.095$), suggesting that larger location tends to result in more orders; however, due to the p-value being $.452$, which is greater than the significance level, the correlation lacks statistical significance.

5 Discussion and implications

This empirical study set out to investigate adopters and non-adopter of OGS among people aged 50 and above. The study utilized an online survey to determine the extent to which purchasing habits have been altered. Moreover, the intention was to identify the factors that influence OGS within this specific age cohort and subsequently ascertain whether these factors act as facilitators or impediments to the aforementioned behavior. These results have several practical implications for online grocery retailers.

Our results show that the majority of individuals in the over-50 age group have yet to acquire any experience in OGS, and the outbreak of the COVID-19 pandemic has not increased the willingness of a majority of them to pursue OGS for more purchases in the future. Surprisingly, 76.9% of OGS adopters stated that they have not increased online ordering since 2020 and continue to buy their groceries mainly in brick-and-mortar shops. 40% of those who tried OGS even stated that they had completely returned to brick-and-mortar shopping. This result aligns with previous research in Canada and Norway [26, 27] and complements [22], indicating that elderly are mostly reluctant to OGS and prefer shopping for groceries in-store. In addition, it seems that online grocers failed in building up long term customer relationships with the OGS adopters of this specific age group [35]. This highlights a missed opportunity for online grocery retailers to cement new consumer habits during the pandemic.

However, it is important to acknowledge that despite the fact that most individuals still prefer to shop in physical stores, a relatively substantial percentage also engage in online shopping. Specifically, almost 60% of the interviewed OGS adopters have incorporated online channels when making their purchases. Furthermore, over 15% are considering buying the majority of their purchases online in the future. This indicates that a considerable proportion of individuals explore the advantages of OGS for themselves, consequently leading them to include this additional shopping channel in their established routines. Thus, the post-pandemic hybrid shopping behavior assumed by [24, 63] also applies to the 50+ age group and not only for the younger generation as found by [71]. Online grocers now have to build a strategy how the elderly OGS adopters that shop from time to time or selective may be converted to passionate OGS shoppers who cover most or all of their everyday grocery needs via online channels.

In our study identified drivers which led to OGS were home delivery, greater product variety, convenience and curiosity. All these aspects show that OGS was mainly used for pure self-interest or to cover and simplify one's own needs and daily life among our respondents which goes in line with results found in [10, 68].

In contrast to prior studies [11, 23, 63], health-related concerns such as about a COVID-19 infection could not be identified as a significant factor for OGS for the majority of people over-50. This was surprising as the study by [39] revealed that many of the elderly in Germany feel uncomfortable when shopping at brick-and-mortar stores and thus opt for OGS. This factor might have been eased by the availability of vaccination and the pandemic progress [24, 63, 90].

Further, important factors for the over -50s are convenience and comfort. This does not reveal a focus on saving time, which is a very important factor for younger German consumers as shown by [10, 11]. Thus, online grocers should emphasize on providing an elderly-friendly OGS platform and services that support convenience and comfort specific to this cohort also to tie them on the long-term. For instance, through functions like shopping lists or previously bought products so that nothing is forgotten, or with recommendations for alternatives when a specific product is out of stock. Furthermore, functions for meal planning with (own) recipes or specific dietary, can make the planning of the purchase easier and the ordering process is smoothed through the integration, because the required items can be placed directly

into the shopping cart when reading the recipes. Additionally showing new recipes can serve as inspiration.

Our results show that non-refrigerated, shelf-stable goods are popular among the over-50s partaking in our study, with the greatest demand for spices, cooking oils, grain products, etc. reported by respondents. The availability of a wider variety of products with exclusive or unusual speciality products and delicacies not available in the corner shop was also a main driver for buying groceries online for the elderly. Thus, an appropriate product assortment can serve as differentiating feature. In particular specialist grocers can effectively convey their unique value proposition to this consumer group. But also brick-and-mortar grocers may use the online channel for specialities assortments as virtual shelf extension.

It is worth noting, however, that fresh products such as fruits and vegetables are also among the product groups that are ordered online. This result is in contrast to previous studies as discussed in [10, 11, 36], which suggested German consumers are not willing to shop fresh products online. This finding suggests online grocery retailers have successfully established a certain level of trust among the OGS adopters in terms of meeting quality expectations. At the same time, it shows the presence of potential growth opportunities for these products in the OGS sector as fresh products account for a significant proportion of sales in grocery retail. It may also be the trigger for occasional shoppers to conduct all necessary purchases of groceries online.

Home delivery is the primary reason for ordering groceries online for the OGS adopters. 88% even stated that they exclusively selected the home delivery model for their purchase—being contrary to findings among Swedish elderly by [24]. Therefore, it can be assumed that convenient shopping is crucial for the over-50s group. Many elderly customers find it difficult to go to the grocery store or to carry the heavy bags, making home delivery a valuable support [27]. This point emphasizes that the aforementioned service is most valued and used among elderly Germans, and thus can be seen as a clear advantage over pure brick-and-mortar grocery retail. Moreover, online grocers should develop this as a strength. Similarly, brick-and-mortar grocery retailers may think about home delivery as additional service for elderly—again, taking into account sustainable delivery modes.

Furthermore, this study demonstrates that the lack of interest, the lack of opportunity to examine the goods, and the lack of trust in the quality and freshness of the products are the biggest barriers to engage in OGS for our respondents. Bezirgani and Lachapelle [27] reported a similar result for Canadian elderly. Especially the first aspect shows that the target demographic, although engaged with the Internet, refuses to engage with new trends and prefers traditional shopping [62, 82]. The remaining two factors emphasize the necessity for retailers to establish a foundation of trust and increasingly showcase the fulfillment of requirements in order to stimulate interest and willingness to shop groceries online [11]. To that end, online grocers should therefore operate with greater transparency and return policy, e.g. with a money-back guarantee, and in that way, communicate to the over-50s that products are sometimes even fresher than in-store—especially in co-operation with

local producers. In addition, this should be complemented with a quick and for the over-50s easy complaint management with return options.

Due to the aforementioned hindrances, a big portion of respondents who have yet to adopt OGS persist in maintaining their opposition towards engaging in this activity in the future. Surprisingly, we discovered that 37.7% of interviewed non-adopters contemplate embracing this practice in the future. This suggests that the e-food market holds a considerable potential for growth, and it is plausible that a substantial number of individuals within the 50plus target demographic will eventually be swayed to participate in OGS through the implementation of suitable optimization strategies [35]. Thus, marketing efforts should educate potential customers about the convenience and benefits of OGS, targeting misconceptions and highlighting positive experiences of peers.

In recent years, the need for organic, fair trade or regional products has increased. The survey results showed that the availability of regional products is an important purchase motive not only for the adopters but also for the non-adopters to order groceries online for the first time. This suggests that offering regional foods would be a big incentive to buy foods online in the future for almost 70% of the non-adopters over 50. Thus, online grocers may think about co-operations with local producers especially of fresh products and provide a product portfolio that is very much tailored to the various regional groups of over-50s, for instance in the form of specific subscription boxes for local food. In addition to regional products, sustainability gains importance among the over-50s as, e.g., the respondents' suggested improvements show. In particular, for the non-adopters additional packaging waste and environmental pollution due to transportation is a barrier to use OGS. To increase sustainability, OGS can offer deposit collection and other services when buying groceries. In addition, online grocers should prioritize sustainable delivery modes and sensible route planning to guarantee short transportation distances.

Interestingly, delivery costs or minimum order value are not among the most decisive factors against OGS for the non-adopters. Nevertheless, a low minimum order value and no delivery costs are attractive for around 35% of participants. Consequently, online grocers may attract the over-50s with low additional costs, free-delivery campaigns or over-50s specific coupons.

While our results could not confirm place of residence and monthly household income as significant influencing factors on OGS purchasing behavior among the target group as expected, this possibility cannot be completely dismissed and should be reevaluated.

6 Conclusion

6.1 Limitations and future research

This study, naturally, has limitations that must be acknowledged. Firstly, this study exclusively examined the grocery purchasing behavior of those who already possess familiarity with digital technologies and also use them. Future studies may broaden the sample size to encompass online as well as pen-and-paper survey participants

to analyze differences between digital and non-digital savvy, and it would be valuable to investigate the perspectives of individuals aged 50 and above who are unfamiliar with digital technologies to identify opportunities for their involvement in OGS. Although surveys are an established tool, the answers may not correspond to actual behavior and respondents may also exaggerate when asked about the future use of OGS. Also, we asked OGS adopters directly on the pandemic's influence on their shopping behavior following [11, 82, 85, 89]. This framing might have led to responses deviating from reality due to bias blind spot. To that end, it would be useful to run a second survey with a reframing without explicitly mentioning the pandemic as external factor. Additionally, it would be helpful to verify whether the willingness expressed by the participants corresponds with actual purchase behavior data, e.g. from online grocers.

Furthermore, as mentioned in the sample description, encountering challenges in accessing a larger population and conducting surveys among individuals aged 70 and above proven to be quite difficult. Consequently, the under-representation of the over 70 age group imposes certain constraints, thereby restricting the applicability of the our findings to this specific age bracket to a limited extent. To address this, it is advisable for future studies to employ a considerably larger sample that adequately represents every elderly age group. Nonetheless, the findings obtained can serve as a foundation and initial inclination for further research, allowing for a more precise determination of potential disparities in OGS behavior. Forthcoming studies could also explore the influence that comfort with information technology, residing in single- or multi-adult households, or having the (primary) responsibility for grocery shopping decisions have on the elderly OGS adoption and continuance [85, 97]. In addition, it could be interesting to include younger age groups in order to directly compare the under-50s with the over-50s regarding the influences and barriers.

As reported, a significant part of the OGS adopters surprisingly have not necessarily ordered online more frequently in recent years and continue to primarily shop in brick-and-mortar stores. First studies have observed that elderly stopped or paused technology use after intensive use during the pandemic because of disillusion or unmet service expectation specific for the elderly [98]. Additional research is necessary to investigate reasons and barriers for those who have discontinued online grocery shopping.

The current findings provide a basis for understanding the factors influencing OGS among the over-50 demographic in Germany. This study has not specifically investigated functional technological aspects such as the mediating effect of perceived ease of use and perceived usefulness on OGS adoption among elderly. Conducting usability and user experience testings and expanding this discussion to include the theoretical underpinnings of the Technology Acceptance Model could offer deeper insights how perceived ease of use, perceived usefulness, and facilitating conditions specifically affect the OGS adoption rates among this demographic.

This study is deliberately limited to the German context. The practice of purchasing groceries online in Germany is still in its nascent stages, despite the evident advancements that have occurred in recent years, particularly in the midst of

the pandemic. Nevertheless, the results could be applied to neighboring countries with similar demographics and grocery supply such as Austria, Italy or Poland. In contrast to this situation, in more established OGS markets, the circumstances may diverge, thus warranting the exploration of different countries and markets that possess unique characteristics. Thus, further research is necessary to supplement the findings of prior research on OGS among elderly with both cross-country and country-specific perspectives. Such a comparative analysis with international trends in OGS adoption among similar demographic groups could provide a richer understanding. Highlighting the differences and similarities in adoption rates, drivers, and barriers across countries could help identify unique challenges and opportunities within the German market. Such an analysis might reveal cultural, economic, or policy-related factors influencing OGS adoption rates differently.

6.2 Summary

Even though numerous studies have been conducted on online shopping and OGS, OGS among the elderly is a relatively under-studied topic. Specifically in Germany, which has the largest grocery market in Europe but lags behind with respect to OGS, the over-50s represent a rather overlooked audience [25, 68]. This is surprising considering that almost half of the German population is over 50 years old. Additionally, the 55-64 age group is already the largest segment of all those using e-commerce in Germany. Consequently, this customer segment holds significant untapped potential for the expansion of the online grocery market.

This empirical study sought to explore the phenomenon of OGS adoption among individuals aged 50 and above in Germany, aiming to discern the factors that influence their participation in this digital marketplace. The research findings illuminate the complexities of OGS adoption within this demographic, revealing a landscape where traditional shopping habits remain dominant yet are punctuated by a growing curiosity towards online channels.

The study, adopting the Theory of Planned Behavior, has specifically analyzed changes in OGS adoption among the elderly in Germany since 2020, aligning with recent research on the COVID-19 pandemic's effects on OGS. The pandemic has accelerated the digitization of retail, making it crucial to understand how this demographic is adapting to the changing landscape. While prior research forms the foundation, our study offers a deeper understanding of the drivers and barriers unique to this age group.

The findings possess significant implications for corporations in online grocery business. Addressing a notable gap in existing literature, which primarily concentrates on younger demographics, this research sheds light on the adoption patterns among the elderly in Germany through an online survey with 179 respondents.

Specifically, this study shows that a significant portion of the over-50 demographic exhibits a growing receptivity to OGS, driven by factors such as convenience, access to a wider variety of products, and the appeal of home delivery services. Despite these positive drivers, the study also identifies substantial barriers

to adoption, including a preference for tactile shopping experiences, concerns over product quality and freshness, and a general reluctance to alter established shopping habits.

Foremost, our research reveals that the willingness to order groceries online has not undergone a significant change among a majority of German elderly from 2020 to 2022, despite the growing attention towards OGS in the country. The conservative nature of the over-50 age group, which leans towards traditional in-store shopping, suggests that in-store grocery retailing will likely remain dominant in the future. In fact, there is substantial amount of OGS adopters who no longer continue buying groceries online at all, which needs to be further investigated. Elderly consumers highly value the tangible and in-person shopping experience provided by brick-and-mortar stores.

Nevertheless, the study identifies a noteworthy 37.7% of non-adopters who express a willingness to explore OGS in the future. Amidst the backdrop of growing demographic and increased online activities among individuals aged over 50, there exists a potential for online grocery retailers to profit from this demographic shift.

Tailoring approaches to address the preferences of the over-50 age group and implementing strategies to overcome existing barriers could foster the development of this market and ensure long-term retention of these consumers. The insights derived from this research, such as emphasizing regional products and removing obstacles to purchase through elderly specific services and functions, can play a pivotal role in shaping strategies aimed at increasing OGS adoption within the over-50 demographic. Moreover, the demand for regional and quality products among the over-50s suggests that online grocers could gain a competitive edge by diversifying their offerings to include items that resonate with the values and preferences of older shoppers. Overall, understanding and catering to the unique needs of this age group can contribute to the successful navigation of this evolving market landscape.

The primary drivers for OGS adoption among the over-50s include the convenience of home delivery, access to a greater variety of products, and the appeal of trying something new. This suggests a demographic open to digital solutions that simplify their shopping experience and provide access to products not readily available in physical stores. For online grocers, this highlights the importance of ensuring an easy, accessible, and rewarding online shopping experience, emphasizing the unique benefits that OGS offers over traditional shopping methods.

Finally, this research offers theoretical contributions to e-commerce marketing strategies by highlighting the unique preferences, concerns, and behaviors of older online shoppers. Understanding that the over-50 demographic values trust, quality, and convenience above all in their online shopping experiences can inform more targeted and effective marketing approaches. By acknowledging the diversity within the over-50 demographic and tailoring e-commerce platforms to meet their specific needs, online retailers can better engage this increasingly important consumer segment.

This study enriches existing literature by tailoring technology adoption models to better account for the unique needs and preferences of older consumers. By identifying the barriers to OGS adoption, such as the desire for physical examination of products and lack of trust in product quality, the study contributes to resistance

theoretical approaches. It provides insights into the rational and emotional barriers specific to the elderly demographic, suggesting the need for tailored strategies to overcome resistance to technology adoption.

Further, the study's insights into the barriers and facilitators of OGS adoption among older adults contribute to the broader discourse on digital inclusion. Policy-makers can use this research to inform initiatives that promote digital inclusion and access to regional products.

The study opens avenues for future research to explore longitudinal changes in OGS behavior among elderly, the impact of evolving digital technologies, and the effectiveness of targeted interventions designed to reduce barriers to OGS adoption. Further investigations into the intersection of aging, technology, and consumer behavior will be crucial in fostering an e-commerce ecosystem that supports the needs and aspirations of older consumers. Future research could extend this work by exploring the effectiveness of tailored marketing approaches and evaluating the long-term sustainability of OGS adoption among the over-50 cohort. Additional research is necessary to investigate reasons and barriers for those who have stopped using OGS again.

In summary, this research provides valuable insights into the online grocery shopping behaviors of the over-50 demographic in Germany, highlighting the complexity of their engagement with digital marketplaces. By addressing the theoretical and practical implications of these findings, stakeholders can develop more effective strategies to enhance the digital shopping experience for older adults, ensuring their full participation in the benefits of e-commerce.

Funding Open Access funding enabled and organized by Projekt DEAL.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

1. Alaimo, L. S., Fiore, M., & Galati, A. (2020). How the Covid-19 pandemic is changing online food shopping human behaviour in Italy. *Sustainability*, *12*(22), 9594. <https://doi.org/10.3390/su1229594>

2. Chang, H.-H., & Meyerhoefer, C. D. (2021). Covid-19 and the demand for online food shopping services: Empirical evidence from Taiwan. *American Journal of Agricultural Economics*, 103(2), 448–465. <https://doi.org/10.1111/ajae.12170>
3. Dannenberg, P., Fuchs, M., Riedler, T., & Wiedemann, C. (2020). Digital Transition by COVID-19 Pandemic? The German food online retail. *Tijdschrift voor Economische en Sociale Geografie*, 111(3), 543–560. <https://doi.org/10.1111/tesg.12453>
4. Handelsverband Deutschland-HDE e.V.: HDE Online-Monitor 2022 (2022). https://einzelhandel.de/index.php?option=com_attachments&task=download&id=10659. Accessed 27, August 2023
5. Handelsverband Deutschland-HDE e.V.: HDE Online-Monitor 2023 (2023). https://einzelhandel.de/images/attachments/article/2876/HDE_Online_Monitor_2023.pdf. Accessed 27 December, 2023
6. Bitkom Research (2021). E-Commerce-Trends 2021: So shoppen die Deutschen im Netz. <https://www.bitkom.org/Presse/Presseinformation/E-Commerce-Trends-2021>. Accessed 18 July, 2023
7. Dederichs, S., & Dannenberg, P. (2021). Spatial change in German online food retailing: Examples from brick-and-mortar, pure-play and combined e-commerce. *Raumforschung und Raumordnung | Spatial Research and Planning*, 79(6), 590–605. <https://doi.org/10.14512/rur.102>
8. Schils, L., & Groenenboom, D. (2023). Uncovering friction in e-Grocery. Experience as a growth driver. https://www.gfk.com/hubfs/GfK%20and%20Mobiquty%20E-commerce%20webinar_Friction%20in%20e-Grocery_Webinar_HANDOUT%20SLIDES.pdf. Accessed 28 July, 2023
9. García, M. R., Romero, I. G., Bas, Á. O., & Prado-Prado, J. C. (2022). E-grocery retailing: From value proposition to logistics strategy. *International Journal of Logistics Research and Applications*, 25(10), 1381–1400. <https://doi.org/10.1080/13675567.2021.1900086>
10. Seitz, C., Pokrivčák, J., Tóth, M., & Plevný, M. (2017). Online grocery retailing in Germany: An explorative analysis. *Journal of Business Economics and Management*, 18(6), 1243–1263. <https://doi.org/10.3846/16111699.2017.1410218>
11. Gruntkowski, L. M., & Martinez, L. F. (2022). Online grocery shopping in Germany: Assessing the impact of COVID-19. *Journal of Theoretical and Applied Electronic Commerce Research*, 17(3), 984–1002. <https://doi.org/10.3390/jtaer17030050>
12. Piroth, P., Rüger-Muck, E., & Bruwer, J. (2020). Digitalisation in grocery retailing in Germany: An exploratory study. *The International Review of Retail, Distribution and Consumer Research*, 30(5), 479–497. <https://doi.org/10.1080/09593969.2020.1738260>
13. Zavialova, S., & Lindlahr, S. (2023). Food eCommerce: market data and analysis. <https://de.statista.com/statistik/studie/id/124987/dokument/lebensmittel-ecommerce-report/>. Accessed 27 December, 2023
14. Thedens, T., & Schumann-Plekat, C. (2023). German online grocery report 2023. Ultimate Overview of Online Food Retailing in Germany in 2023 and Beyond.
15. Statistisches Bundesamt (Destatis) (2022). Private Haushalte in der Informationsgesellschaft - Nutzung von Informations- und Kommunikationstechnologien (Mikrozensus-Unter Stichprobe zur Internetnutzung) - Fachserie 15 Reihe 4 - 2022 (Letzte Ausgabe - berichtsweise eingestellt). <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Einkommen-Konsum-Lebensbedingungen/IT-Nutzung/Publikationen/Downloads-IT-Nutzung/private-haushalte-ikt-2150400227004.pdf> Accessed 28 December, 2023
16. Statistisches Bundesamt (2023). (Destatis)-GENESIS Online: 12411-0005: Population: Germany, reference date, age. <https://www-genesis.destatis.de/genesis/online?operation=table&code=12411-0005&bypass=true&levelindex=1&levelid=1669554625928&language=en>. Accessed 28 July, 2023
17. Statistisches Bundesamt (2022). (Destatis)-GENESIS Online: 12421-0002: Projected population figures: Germany, reference date, variants of the population projection, sex, age years. <https://www-genesis.destatis.de/genesis/online?operation=table&code=12421-0002&bypass=true&levelindex=0&levelid=1704467479648&language=en>. Accessed 28 July, 2023
18. Beisch, N., & Koch, W. (2022). ARD/ZDF-Onlinestudie: Vier von fünf Personen in Deutschland nutzen täglich das Internet. *Media Perspektiven* 2022(10), 460–470. Accessed 18, July 2023
19. Beisch, N., & Koch, W. (2023). ARD/ZDF-Onlinestudie: Weitergehende Normalisierung der Internetnutzung nach Wegfall aller Corona-Schutzmaßnahmen. *Media Perspektiven* 2023(23), 1–9. Accessed 28 December, 2023
20. Statista (2023). Verteilung der Nutzer im E-Commerce-Markt nach Altersgruppen in Deutschland im Jahr 2023. <https://de.statista.com/prognosen/488024/e-commerce-nutzer-nach-alter-und-geschlecht-in-deutschland>. Accessed 27 August, 2023

21. Bitkom e.V. (2020). Viele Senioren kaufen Lebensmittel im Netz. <https://www.bitkom.org/Presse/Presseinformation/Viele-Senioren-kaufen-Lebensmittel-im-Netz>. Accessed 18 July, 2023
22. KPMG AG. (2021). Online-Shopping-Studie. Einkaufsverhalten-wer kauft was, wann, wie. <https://assets.kpmg.com/content/dam/kpmg/ch/pdf/studie-online-shopping-kpmg-2021.pdf>. Accessed 18 July, 2023
23. Bauerová, R. (2021). Nakupovani potravin online jako vysada milenialu. je to stale pravda i v obdobi pandemie covidu-19? *Acta academica karviniensia* 21(1), 15–28. <https://doi.org/10.25142/aak.2021.002>
24. Hansson, L., Holmberg, U., & Post, A. (2022). Reorganising grocery shopping practices-the case of elderly consumers. *The International Review of Retail, Distribution and Consumer Research*, 32(4), 351–369. <https://doi.org/10.1080/09593969.2022.2085137>
25. Yap, Y.-Y., Tan, S.-H., Tan, S.-K., & Choon, S.-W. (2022). Integrating the capability approach and technology acceptance model to explain the elderly's use intention of online grocery shopping. *Telematics and Informatics*, 72, 101842. <https://doi.org/10.1016/j.tele.2022.101842>
26. Kvalsvik, F. (2022). Understanding the role of situational factors on online grocery shopping among older adults. *Journal of Retailing and Consumer Services*, 68, 103009. <https://doi.org/10.1016/j.jretconser.2022.103009>
27. Bezirgani, A., & Lachapelle, U. (2021). Qualitative study on factors influencing aging population's online grocery shopping and mode choice when grocery shopping in person. *Transportation Research Record*, 2675(1), 79–92. <https://doi.org/10.1177/0361198120964790>
28. Oeser, G., Aygün, T., Balan, C.-L., Paffrath, R., & Schuckel, M. T. (2019). Segmenting elder German grocery shoppers based on shopping motivations. *International Journal of Retail and Distribution Management*, 47(2), 129–156. <https://doi.org/10.1108/IJRDM-02-2018-0033>
29. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-t](https://doi.org/10.1016/0749-5978(91)90020-t)
30. Driediger, F., & Bhatiasevi, V. (2019). Online grocery shopping in Thailand: Consumer acceptance and usage behavior. *Journal of Retailing and Consumer Services*, 48, 224–237. <https://doi.org/10.1016/j.jretconser.2019.02.005>
31. Bundesamt, S. (2020). Online trade is steadily gaining in importance. <https://www.destatis.de/EN/Themes/Economy/Wholesale-Trade-Retail-Trade/turnover-online-trade.html>. Accessed 18 July 2023
32. Statista (2022). Platform-to-Consumer Delivery-Turnover in Germany. <https://de.statista.com/outlook/dmo/eservices/online-food-delivery/platform-to-consumer-delivery/deutschland>. Accessed 27 August 2023
33. Schu, M. (2021). Das E-Food-Buch: Märkte–Player–Strategien. dfv Mediengruppe Fachbuch, Frankfurt am Main
34. Handelsverband Deutschland-HDE e.V. (2020). HDE Online-Monitor 2020. https://einzelhandel.de/index.php?option=com_attachments&task=download&id=10624. Accessed 27 August, 2023
35. Brüggemann, P., & Olbrich, R. (2022). The impact of Covid-19 pandemic restrictions on offline and online grocery shopping: New normal or old habits? *Electronic Commerce Research*. <https://doi.org/10.1007/s10660-022-09658-1>
36. PwC (2018). Online-Lebensmittelhandel vor dem Durchbruch in Deutschland. <https://www.pwc.de/de/handel-und-konsumguter/pwc-studie-online-lebensmittelhandel-2018.pdf>. Accessed 18 July, 2023
37. Frank, D.-A., & Peschel, A. O. (2020). Sweetening the deal: The ingredients that drive consumer adoption of online grocery shopping. *Journal of Food Products Marketing*, 26(8), 535–544. <https://doi.org/10.1080/10454446.2020.1829523>
38. Bartók, O., Kozák, V., & Bauerová, R. (2021). Online grocery shopping: The customers' perspective in the Czech Republic. *Equilibrium Quarterly Journal of Economics and Economic Policy*, 16(3), 679–695. <https://doi.org/10.24136/eq.2021.025>
39. Thedens, T., & Hachibiti, M. (2022). German online grocery report 2022. Ultimate Overview of Online Food Retailing in Germany in 2022 and Beyond
40. Mihr, R. (2023). Edeka wächst-Rewe holt auf. *Lebensmittel Praxis*, 2023(5), 28–31.
41. ecommerceDB.com: Top eCommerce stores in the German Grocery market. <https://ecommercedb.com/ranking/stores/de/grocery>. Accessed 28 December, 2023
42. Heinemann, G. (2023). *Forms of online trade* (pp. 179–260). Wiesbaden: Springer. https://doi.org/10.1007/978-3-658-40757-5_3

43. Warschun, M., & Rühle, J. (2011). Online-Food-Retailing - Nischenmarkt mit Potenzial. <http://docplayer.org/3401030-Online-food-retailing-nischenmarkt-mit-potenzialkonzepte-herausforderung-en-und-marktpotenzial-fuer-den-handel-in-deutschland.html>. Accessed 18 July 2023
44. Bundesministerium für Gesundheit (2023). Coronavirus-Pandemie: Was geschah wann?. <https://www.bundesgesundheitsministerium.de/coronavirus/chronik-coronavirus.html> Accessed 28 July, 2023
45. dpd group: E-Shopper Barometer 2021 (2022). <https://www.dpd.com/de/de/news/bei-online-shop-pern-boomen-frischeprodukte/> Accessed 18.07.2023
46. Huang, M., & Yen, B. P. C. (2021). Driving Forces for Digital Transformation—Case Studies of Q-Commerce. In *Proceedings of the international conference on electronic business (ICEB)* (Vol. 21, pp. 117–128).
47. EHI Retail Institute (2022). Umsatzentwicklung im Online-Handel mit Lebensmitteln in Deutschland (2015–2021). <https://www.handelsdaten.de/umsatzentwicklung-im-online-handel-mit-lebensmitteln-deutschland-2015-2021>. Accessed 18 July, 2023
48. KPMG AG: KPMG Retail Sales Monitor, Ausgabe 1/2022. (2022). Entwicklungen im deutschen Einzelhandel-Fokus: Quick Commerce. <https://hub.kpmg.de/retail-sales-monitor-01-2022>. Accessed 28 August, 2023
49. Bundesverband E-Commerce und Versandhandel Deutschland e.V. (bevh) (2022). E-Commerce ist das neue “Normal”. https://bevh.org/fileadmin/content/05_presse/Pressemitteilungen_2022/220126_-_Praesentation_bevh_Jahrespressegesprach_2022.pdf. Accessed 28 July, 2023
50. Statistisches Bundesamt (2021). (Destatis)-GENESIS Online: 73311-0002: Turnover taxpayers, taxable turnover, turnover tax (advance returns): Germany, years, economic activities (WZ2008 1-5-digit hierarchy). https://www-genesis.destatis.de/genesis//online?operation=table_&code=73311-0002_&bypass=true_&levelindex=0_&levelid=1704645098175_&language=english. Accessed 28 July, 2023
51. EHI Retail Institute (2022). Marktanteil des Online-Lebensmittelhandels in Europa im Landervergleich im Jahr 2022 mit Prognose für 2030 (in Prozent), gemessen am Gesamtumsatz des Lebensmittelhandels. <https://www.handelsdaten.de/lebensmittelhandel/2030-prognose-marktanteil-e-food-umsatz-lebensmitteleinzelhandel-europa-2030>. Accessed 27 December, 2023
52. McKinsey & Company (2023). The State of Grocery Retail 2023. <https://www.mckinsey.com/industries/retail/our-insights/state-of-grocery-europe>. Accessed 28 December, 2023
53. Bundeskartellamt (2015). Beschluss In dem Verwaltungsverfahren B2-96/14 Fusionskontrollverfahren Verfügung gem. §40 Abs. 2 GWB. https://www.bundeskartellamt.de/SharedDocs/Entscheidung/DE/Entscheidungen/Fusionskontrolle/2015/B2-96-14.pdf;jsessionid=A04EC1FF980C6FD53A2497F6BCFB5068.2_cid390?__blob=publicationFile_&v=3
54. Bundesamt, S. (2022). Private consumption expenditure of households (Germany). <https://www.destatis.de/EN/Themes/Society-Environment/Income-Consumption-Living-Conditions/Consumption-Expenditure/Tables/private-consumption-d-lwr.html>. Accessed 18 July, 2023
55. Eurostat (2023). Final consumption expenditure of households, by consumption purpose. https://ec.europa.eu/eurostat/databrowser/view/tec00134/bookmark/table?lang=en_&bookmarkId=2e81189f-df11-4e66-85f4-2700af53a4a6. Accessed 27 December, 2023
56. Statista (2023). Average Revenue Per User (ARPU) im E-Commerce-Markt für Lebensmittel & Getränke in Deutschland im Jahr 2020 sowie eine Prognose bis 2028. <https://de.statista.com/prognosen/490418/prognose-des-arpus-im-e-commerce-lebensmittel-und-getraenke-deutschland>. Accessed 11 January, 2024
57. Statista (2021). Verteilung der Nutzer im E-Commerce-Markt für Lebensmittel und Getränke nach Einkommensgruppen in Deutschland im Jahr 2021. <https://de.statista.com/statistik/daten/studie/490466/umfrage/e-commerce-nutzer-im-segment-nahrungsmittel-und-getraenke-nach-einkommen-deutschland/> Accessed 28 December, 2023
58. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319. <https://doi.org/10.2307/249008>
59. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425. <https://doi.org/10.2307/30036540>
60. Hansen, T. (2008). Consumer values, the theory of planned behaviour and online grocery shopping. *International Journal of Consumer Studies*, 32(2), 128–137. <https://doi.org/10.1111/j.1470-6431.2007.00655.x>

61. Rahma, D. W., Tyas, S. H. Y., & Muftikhali, Q. E. (2023). Why do consumers adopt E-grocery? A systematic literature review. *Journal of Informatics and Communications Technology (JICT)*, 4(2), 21. https://doi.org/10.52661/j_ict.v4i2.133
62. Jensen, K. L., Yenerall, J., Chen, X., & Yu, T. E. (2021). US consumers' online shopping behaviors and intentions during and after the COVID-19 pandemic. *Journal of Agricultural and Applied Economics*, 53(3), 416–434. <https://doi.org/10.1017/aae.2021.15>
63. Eriksson, N., & Stenius, M. (2022). Online grocery shoppers due to the covid-19 pandemic—an analysis of demographic and household characteristics. *Procedia Computer Science*, 196, 93–100. <https://doi.org/10.1016/j.procs.2021.11.077>
64. Berg, J., & Henriksson, M. (2020). In search of the 'good life': Understanding online grocery shopping and everyday mobility as social practices. *Journal of Transport Geography*, 83, 102633. <https://doi.org/10.1016/j.jtrangeo.2020.102633>
65. Gizycki, V & Pöhlmann, V. (2021). In: Naskrent, J., Stumpf, M., Westphal, J. (eds.) Kaufverhalten im Lebensmitteleinzelhandel zwischen digital und stationär – eine Segmentierung (pp. 47–64). Springer, Wiesbaden. https://doi.org/10.1007/978-3-658-29367-3_3
66. Grunwald, A., Schrage, R., Rinnebach, P., Kahle, M., Knuff, M., & Steiner, T. (2022). Grocery insights 2022. Final call for German E-Grocery. <https://www.accenture.com/ch-en/insights/retail/grocery-insights-2022>. Accessed 18 July, 2023
67. Singh, R. (2019). Why do online grocery shoppers switch or stay? An exploratory analysis of consumers' response to online grocery shopping experience. *International Journal of Retail and Distribution Management*, 47(12), 1300–1317. <https://doi.org/10.1108/IJRDM-10-2018-0224>
68. Frentz, F. (2020). *Fifty-one reasons consumers shop for groceries online: A mixed-methods examination of motives for online grocery shopping in the United States and Germany* (pp. 93–103). Wiesbaden: Springer. https://doi.org/10.1007/978-3-658-30366-2_4
69. Hutapea, L., & Malanowski, N. (2019). Neue Geschäftsmodelle in der Ernährungsindustrie und im Lebensmitteleinzelhandel. Working Paper Forschungsförderung 141, Hans-Böckler-Stiftung, Düsseldorf. <https://ideas.repec.org/p/zbw/hbsfof/141.html>
70. Bitkom Research (2019). E-Commerce-Trends—So shoppen die Deutschen 2019. https://www.bitkom.org/sites/default/files/2019-01/Bitkom-Charts%20PK%20Handel%2024012019_0.pdf. Accessed 18 July, 2023
71. Brüggemann, P., & Pauwels, K. (2022). Consumers' attitudes and purchases in online versus offline grocery shopping. In F. J. Martínez-López, J. C. Gázquez-Abad, & M. Ieva (Eds.), *Advances in national brand and private label marketing* (pp. 39–46). Cham: Springer.
72. Oliver Wyman (2017). Frisch oder Stirb. Sechs Kategorien für Frische der Weltklasse. https://www.oliverwyman.de/content/dam/oliver-wyman/v2-de/publications/2017/jun/2017_Oliver_Wyman_Frisch_oder_stirb_web_new.pdf. Accessed 28 July, 2023
73. Mau, G., Schweizer, M., & Oriet, C. (2021). Multisensorik Im Stationären Handel. Springer Fachmedien Wiesbaden, Wiesbaden. <https://doi.org/10.1007/978-3-658-31273-2>
74. Statistisches Bundesamt (Destatis) (2022). 4 million more people aged 67 or over will live in Germany in 2035. Press release No. 511 of 2 December 2022. https://www.destatis.de/EN/Press/2022/12/PE22_511_124.html. Accessed 28 July, 2023
75. Statistisches Bundesamt (Destatis) (2019). Bevölkerung im Wandel. Annahmen und Ergebnisse der 14. koordinierten Bevölkerungsvorausberechnung. <https://www.destatis.de/DE/Presse/Pressekonferenzen/2019/Bevoelkerung/pressebroschuere-bevoelkerung.pdf>. Accessed 28 July, 2023
76. Nufer, G. (2017). Zielgruppe 50+: Nenne sie niemals senioren! *Markenartikel : das Magazin für Markenführung*, 79(1–2), 38–40. <https://doi.org/10.34645/opus-1249>
77. Wellner, K. (2015). *The silver market phenomenon* (pp. 9–25). Wiesbaden: Springer. https://doi.org/10.1007/978-3-658-09044-9_2
78. Marwede, M. (2017). *Theoretical foundations of silver agers and user involvement* (pp. 11–31). Wiesbaden: Springer. https://doi.org/10.1007/978-3-658-18325-7_2
79. Pompe, H.-G. (2013). Marketing 50plus für die Zielgruppe der Zukunft (pp. 95–119). Springer, Wiesbaden. https://doi.org/10.1007/978-3-658-00903-8_5
80. Meiners, N. H., & Seeburger, B. (2010). Marketing to senior citizens: Challenges and opportunities. *The Journal of Social, Political, and Economic Studies*, 35(3), 293–328.
81. Hiser, J., Nayga, J. Rodolfo M., & Capps, J. (1999). Oral: An exploratory analysis of familiarity and willingness to use online food shopping services in a local area of texas. *Journal of Food Distribution Research* (856-2016-57411), 13 <https://doi.org/10.22004/ag.econ.26794>

82. 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>
83. Meister, A., Winkler, C., Schmid, B., & Axhausen, K. (2023). In-store or online grocery shopping before and during the Covid-19 pandemic. *Travel Behaviour and Society*, 30, 291–301. <https://doi.org/10.1016/j.tbs.2022.08.010>
84. Deichner, N., Sauerwein, S., Freundl, C., Peters, A., & Wittmann, G. (2022). Konsumentenverhalten-quo vadis? <https://ibi.de/veroeffentlichungen/2023/konsumentenverhalten-quo-vadis>. Accessed 18 July, 2023
85. Shaw, N., Eschenbrenner, B., & Baier, D. (2022). Online shopping continuance after covid-19: A comparison of Canada, Germany and the United States. *Journal of Retailing and Consumer Services*, 69, 103100. <https://doi.org/10.1016/j.jretconser.2022.103100>
86. Lo, A., Duffy, E., & Ng, S. W. (2021). Who's grocery shopping online and why: Cross-sectional analysis of a nationally-representative sample since the pandemic. *Current Developments in Nutrition*, 5, 231. https://doi.org/10.1093/cdn/nzab029_032
87. Dominić, A., Boncinelli, F., Gerini, F., & Marone, E. (2021). Determinants of online food purchasing: The impact of socio-demographic and situational factors. *Journal of Retailing and Consumer Services*, 60, 102473. <https://doi.org/10.1016/j.jretconser.2021.102473>
88. Kühn, F., Lichters, M., & Krey, N. (2020). The touchy issue of produce: Need for touch in online grocery retailing. *Journal of Business Research*, 117, 244–255. <https://doi.org/10.1016/j.jbusres.2020.05.017>
89. Dangelico, R. M., Schiaroli, V., & Fraccascia, L. (2022). Is Covid-19 changing sustainable consumer behavior? A survey of Italian consumers. *Sustainable Development*, 30(6), 1477–1496. <https://doi.org/10.1002/sd.2322>
90. Asgari, H., Azimi, G., Titiloye, I., & Jin, X. (2023). Exploring the influences of personal attitudes on the intention of continuing online grocery shopping after the Covid-19 pandemic. *Travel Behaviour and Society*, 33, 100622. <https://doi.org/10.1016/j.tbs.2023.100622>
91. Döring, N. (2023). *Forschungsmethoden und Evaluation in Den Sozial- und Humanwissenschaften*. Springer. <https://doi.org/10.1007/978-3-662-64762-2>
92. Robert Koch Institut (2023). Digitales Impfquotenmonitoring zur COVID-19-Impfung. https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Daten/Impfquoten-Tab.html. Accessed 28 July, 2023
93. Bundesamt, S. (2020). Ältere Menschen in Stadt und Land. <https://www.destatis.de/DE/Themen/Querschnitt/Demografischer-Wandel/Aeltere-Menschen/stadt-land.html>. Accessed 28 December, 2023
94. Bohg, I., & Leger, J. (2013). In: Kampmann, B., Keller, B., Knippelmeyer, M., & Wagner, F. (Eds.), *Lebensmittel online bestellen? Frauen als Zielgruppe der Lebensmittel-Onlinehändler* (pp. 97–108). Gabler Verlag. https://doi.org/10.1007/978-3-8349-4129-9_6
95. Pompe, H.-G. (2013). Die Zielgruppen 50plus (pp. 73–93). Springer. https://doi.org/10.1007/978-3-658-00903-8_4
96. Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*, 2 edn. Erlbaum, Hillsdale. <http://www.loc.gov/catdir/enhancements/fy0731/88012110-d.html>
97. Van Hove, L. (2022). Consumer characteristics and e-grocery services: The primacy of the primary shopper. *Electronic Commerce Research*, 22(2), 241–266. <https://doi.org/10.1007/s10660-022-09551-x>
98. Chang, F., & Gu, Z. (2023). When to say bye: A qualitative study of older adults' discontinuation of technology use after the pandemic. In *IASDR 2023: Life-changing design*. IASDR 2023. Design Research Society. <https://doi.org/10.21606/iasdr.2023.351>

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.