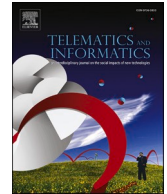




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Online grocery shopping before and during the COVID-19 pandemic: A meta-analytical review

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ABSTRACT

The COVID-19 pandemic has forced people to limit their physical interactions, which has led to explosive growth in online grocery shopping. However, there is no clear consensus in the retailing literature on whether consumers prefer to buy groceries online. The objective of this current study is to synthesize research about online grocery shopping published before and during the COVID-19 pandemic and to develop a conceptual framework about online grocery purchase intentions and their determinants, the mediation effects of consumers' attitudes, the moderating effects of COVID-19, and control variables. The *meta-analysis* presents data derived from 50 independent samples with a sample size of 20,538 respondents. Selected determinants were identified as triggers for online grocery purchase intentions, and perceived usefulness and consumer attitude were identified as important mediators between determinants and intentions. The findings clarify the mechanisms behind the increase in online grocery shopping during the pandemic by presenting a decrease in the importance of its strongest determinants (i.e., perceived usefulness and attitude). Based on these findings, we present contributions to theory, managerial implications, and future research directions.

1. Introduction

It took a long time before online grocery sales became popular. According to [Forbes \(2020\)](#), in 2019, 81% of US consumers had never purchased groceries online. However, with the outbreak of the COVID-19 pandemic, the situation has turned the other way around. In 2020, 79% of US consumers ordered their groceries online. Online grocery sales in the US increased from 1.2 billion USD in August 2019 to 7.2 billion USD in June 2020 ([Forbes, 2020](#)). [McKinsey \(2020\)](#) consistently reports that 15% of European consumers have adopted new online grocery services, and 12% of consumers have even switched to new grocery stores after home deliveries or click-and-collect services. These new customer segments seem to continue using online grocery services even after the first pandemic spike ([Winsight Grocery Business, 2021](#)).

Online grocery shopping refers to buying groceries online using click-and-collect or home delivery services ([Brand et al., 2020](#)). Several empirical studies have examined online grocery purchase intentions from diverse angles across marketing and information systems research since the early 21st century. A review of the online-grocery-retailing literature reveals that the focus has been on technological perspectives, and research has relied heavily on technological models, such as the technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT), and psychological models, such as the theory of planned

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behavior (TPB). Also, academic researchers have included emotional aspects (e.g., entertainment, enjoyment, or hedonic shopping motivation) in these technological frameworks. However, despite the research interest in online grocery shopping, a unified *meta*-analytical framework combining the key determinants influencing this phenomenon has yet to be presented, which has created a need for *meta*-analytical research. Thus, this *meta*-analysis synthesizes previous studies presenting both technological and emotional perspectives, and resolves the inconsistency of previous studies. From a managerial perspective, these results illustrate the most valuable attributes managers should emphasize regarding online grocery services.

According to McKinsey (2020), only around 15% of consumers in Italy, Germany, and France are satisfied with their online grocery service. This supports the assumption that although COVID-19 has forced consumers to use online grocery services, there is still an extensive need to improve these services. Therefore, this *meta*-analysis not only aims to determine essential factors influencing consumers' attitudes and to keep online grocery customers purchasing after the pandemic but also to describe the mediation effects of consumers' attitudes and perceived usefulness between determinants and behavioral intentions. Including these mediation mechanisms in a *meta*-analytical study helps researchers evaluate the risk of overestimating or underestimating the impact of determinants (Iyer et al., 2020). Investigating these mediators can help retailers emphasize the valuable attributes of their online grocery services.

Due to COVID-19, consumers have suddenly been forced to change their habits and prioritize online channels in their shopping (Pan et al. 2020; Pantano et al., 2020; Seth, 2020). Also, in the grocery sector, the pandemic has driven sales strongly toward online channels (Pantano et al., 2020). As a result of the growing popularity of online grocery shopping, research interest has increased, and the need to evaluate the impact of the pandemic on consumer behavior has been recognized in marketing science (Ha and Harris, 2020; Roggeveen and Sethuraman, 2020). Despite increasing interest in this topic, the literature remains unclear as to how the COVID-19 pandemic has changed consumers' opinions regarding online grocery shopping. Although the pandemic has generated a new wave of research addressing online grocery shopping behavior, no existing study has addressed the immediate effects of COVID-19 on consumers' online grocery shopping behavior. Therefore, this *meta*-analysis addresses the moderating effect of COVID-19 on the determinants of online grocery purchase intentions and provides valuable information for retailers by comparing the effects before and during the pandemic.

This article is organized as follows. First, the theoretical models and core concepts of the *meta*-analytical framework of this study are presented. Second, the research methodology is explained. The third section presents the results in the form of reporting the direct effects, mediators, and moderators of the *meta*-analysis. Finally, we discuss the theoretical and managerial contributions and study limitations, and provide future research directions.

Table 1
Definitions of constructs and theoretical roots.

Category	Construct	Definition	TAM	UTAUT/ UTAUT2	TPB	Other
Determinants	Ease-of-use	"The degree to which a person believes that using a particular system would be free of effort" (Davis <i>et al.</i> , 1989, p. 320)	✓	✓Effort expectancy		✓Complexity
	Perceived risk	Risk is a probability, while uncertainty exists when knowledge of a precise probability is lacking (Knight, 1948).				✓
	Trust	Willingness to rely on exchange partners and that their ability to perform its stated function (Chaudhuri and Holbrook, 2001)				✓
	Price value	The level of price, and entails pricing-related cues (e.g., unit pricing) (Zielke, 2011)		✓		
	Positive emotions	Positive emotions refer to consumers' state of mind resulting from a cognitive and affective evaluation of their consumption (Bagozzi <i>et al.</i> , 1999)			✓Hedonic motivation	✓Enjoyment/Entertainment
	Social influence	A "person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein and Ajzen, 1975, p. 302)			✓Social influence	✓Subjective norm
Mediators	Perceived usefulness	"The degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, <i>et al.</i> , 1989, p. 320)	✓	✓Performance expectancy		✓Relative advantage
	Attitude	Consumers positive or negative feelings about putting the targeted behavior into practice (Venkatesh <i>et al.</i> , 2003)	✓		✓	
Outcomes	Behavioral intention	A consumer's intention to perform a specific behavior (Davis <i>et al.</i> , 1989)	✓	✓	✓	

2. Conceptual framework

2.1. Theoretical underpinnings explaining online grocery shopping behavior

Studies have used various theories to describe online grocery shopping behavior. In this study, we integrated determinants from technological perspectives (TAM and UTAUT) and psychological perspectives (TPB).

The TAM was originally presented by Davis et al. (1986) and is most commonly used to describe the acceptance of information systems (Lee et al., 2003). Online grocery services are no exception, as TAM has been widely used to explain online grocery purchase intentions. TAM assumes that the intention to use an information system is mainly determined by perceived usefulness and ease-of-use. The outcome of TAM (i.e., actual usage) is then predicted by this intention.

UTAUT integrates determinants from previous theories and explains behavioral intentions via performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). Later, the model was complemented by hedonic motivation, price value, and habit (UTAUT2) (Venkatesh et al., 2012). UTAUT integrates the social elements of online grocery shopping, which supports its use in this context.

TPB explains consumer-usage intentions through a consumer's attitude, perceived behavioral control, and subjective norms (Ajzen, 1991). It is well suited for explaining online grocery intentions because, like UTAUT models, it considers social elements, which have been seen as a special feature of food retailing (Hansen et al., 2004).

These models' constructs differ significantly, and researchers have typically added new constructs to them, which has resulted in a situation in which the mechanisms influencing online grocery shopping remain unclear. We aim to integrate constructs from these theories and provide a comprehensive model of online grocery purchase intentions. Because this arrangement outperforms any individual theory, we provide a more complete understanding of a topic in which these theories offer complementary perspectives. Comparing these theories reveals that they include determinants that are conceptually very similar, which indicates the critical importance of these constructs (Blut et al., 2016).

The conceptual framework of this *meta-analysis* is based on these three models (see Figure 1, Tables 1 and 2). Meta-analytical research relies on existing studies; therefore, only determinants with sufficient effect sizes can be included. Therefore, some constructs were excluded from the framework (e.g., perceived behavioral control). Several determinants widely used in recent studies explaining online grocery purchase intention, such as positive emotions and perceived risk, have been integrated into the conceptual framework (Driediger and Bhatiasevi, 2019). We argue that integrating these constructs into our *meta-analytical* framework broadens the perspective of this research.

2.2. Determinants of online grocery adoption

2.2.1. Ease-of-Use

Ease-of-use represents "the degree to which a person believes that using a particular system would be free of effort" (Davis et al., 1989, p. 320). If consumers perceive a system as simple to use, they are likelier to use it (Gelbrich and Sattler, 2014). On the contrary, complexity has a negative impact on usage intention (Kim et al. 2017). In the online shopping context, ease-of-use can be considered the ease-of-use of a retailer's website (Gefen et al., 2003) or mobile app. In previous studies, some argued that effort expectancy introduced in UTAUT corresponds with ease-of-use from TAM, and perceived complexity works as a contrariwise equivalent construct (Blut et al., 2016; Cimperman et al., 2016; Kim and Park, 2012).

Online grocery stores offer new options for grocery shopping and set novel challenges for retailers regarding their services. For example, in the case of a large assortment, the need to scroll multiple screens might interrupt consumers' decision-making (Campo et al., 2021). Because these technologies are new for many consumers, perhaps ease-of-use has a positive impact on online grocery shopping behavior. Thus, we expected ease-of-use to be positively related to online grocery purchase intentions.

2.2.2. Perceived risk

The perceived risk of using technology was originally presented in the diffusion of innovation theory by Rogers (2010), who divided risk into psychological, social, performance, financial, time, and privacy components. In the context of online grocery shopping, risk is a combination of performance risk, time risk, and privacy risk, which are complicating consumer's decision-making process (Driediger and Bhatiasevi, 2019). Performance risk refers to the possibility that a purchased product will fail to achieve the benefits that the

Table 2
Predicted relationships with online grocery purchase intentions.

Determinant	Predicted Effect	Representative Study
Ease-of-use	Ease-of-use increases purchase intentions.	Driediger and Bhatiasevi, 2019
Perceived risk	Perceived risk of online grocery shopping decreases purchase intentions.	Van Droogenbroeck and Van Hove, 2021
Trust	Consumers who trust retailers are more likely to make purchases.	Asti et al., 2021
Price value	Higher price value positively influences purchase intentions.	Handayani et al., 2020
Positive emotions	Positive emotions increase purchase intentions.	Huang and Oppewal, 2006
Social influence	Social influence has a positive impact on purchase intentions.	Hansen et al., 2004
Perceived usefulness	Perceived usefulness positively affects purchase intentions.	Driediger and Bhatiasevi, 2019
Attitude	A consumer's positive attitude toward online grocery services increases purchase intentions.	Hansen et al., 2004

consumer expects (Grewal et al., 1994; Liao et al. 2021). Time risk is related to the possibility of wasting time by making bad purchasing decisions (Featherman and Pavlou, 2003). Privacy risk refers to the possibility of losing control of personal information, such as via the security of payment methods (Driediger and Bhatiasevi, 2019; Featherman and Pavlou, 2003). The perceived risk of online shopping is significantly lower among online shoppers compared to those who don't shop online (Huang et al., 2004). Consequently, we suggest that a service that is relatively new for most consumers causes preconceptions and, thus, perceived risk negatively impacts online grocery purchase intentions.

2.2.3. Trust

Trust represents a consumer's willingness to rely on exchange partners (Chaudhuri and Holbrook, 2001; Moorman et al., 1993). In the shopping context, trust plays a crucial role because it gives consumers peace of mind and therefore positively affects their attitudes and behaviors (Chahal and Rani, 2017; Dwyer et al., 1987). For instance, there is evidence that if a consumer trusts that an exchange partner (in this context, an online grocery service) is performing its function, he or she will be more willing to make purchases (Asti et al., 2021; Kim and Ko, 2010). Thus, we argue that trust has a positive influence on consumers' intentions to shop online.

2.2.4. Price value

Price value refers to the level of price and entails pricing-related cues (e.g., unit pricing) (Zielke, 2011). In research, price is frequently addressed by price level and value (Blut et al., 2018). In this study, we argue that price matters because consumers' financial constraints determine their purchasing behaviors. Even though online grocery shopping offers undisputable benefits, the influence of price cannot be underestimated. The UTAUT2 model shows that a price value is positive if consumers perceive the benefits of using technology to be higher than the monetary cost (Venkatesh et al., 2012), which is also confirmed in the online grocery shopping context (Handyani et al., 2020). We suggest that price value has a positive impact on online grocery purchase intentions.

2.2.5. Positive emotions

Positive emotions result from cognitive and affective evaluations of consumption and represent a consumer's state of mind (Bagozzi et al., 1999). Positive intentions have been shown to influence consumers' purchasing behaviors. For this to happen, consumers may form emotional connections via interactions with the company (Pansari and Kumar, 2017). In previous studies investigating online grocery shopping, researchers integrated entertainment, enjoyment, and hedonic motivation into their frameworks to represent the emotional dimension (Driediger and Bhatiasevi, 2019; Loketkrawee and Bhatiasevi, 2018; Van Droogenbroeck and Van Hove, 2021). In this *meta-analysis*, we followed this logic and adopted entertainment, enjoyment, and hedonic motivation as components of consumers' positive emotions in online grocery shopping. We expected, in line with prior studies, that positive emotions would have a positive impact on online grocery purchase intentions.

2.2.6. Social influence

Subjective norms and social influences are corresponding attributes (Blut et al., 2016). We followed this logic and considered these constructs convergent. A subjective norm is defined as "a person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein and Ajzen, 1975, p. 302). Social influence is defined as "the extent to which consumers perceive that important others (e.g., family, and friends) believe they should use a particular technology" (Venkatesh et al., 2012, p. 159).

Social elements are a special feature of grocery retailing compared to other retailing sectors as a result of the social aspects of food and cuisine (Hansen et al., 2004). The explanation for these perceptions is that food is often chosen for other people (e.g. family and friends), guided by features such as health, taste, and price (Hogreve et al., 2021). Within the online grocery shopping context, social influence has been shown to positively influence consumers' purchase intentions (Driediger and Bhatiasevi, 2019; Hansen et al., 2004). We expected that social influence will positively affect online grocery purchase intentions.

2.3. Mediators

In this *meta-analysis*, we followed the logic of TAM (Davis et al., 1989) and posited perceived usefulness and attitude as mediators. In this *meta-analysis*, the mediating mechanisms aimed to evaluate the risk of overestimating or underestimating the effects of the determinants (Iyer et al., 2020).

2.3.1. Perceived usefulness

Davis et al. (1989, p. 320) defined perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance." In other models, performance expectancy (UTAUT) and relative advantage are considered to be corresponding constructs of perceived usefulness (Blut et al., 2016). The perceived usefulness of online shopping can be viewed via the benefits of technology and the benefits related to shopping (e.g., ordering items) (Gefen et al., 2003). Consumers perceive online grocery shopping services as useful if they can help them save time or effort (Driediger and Bhatiasevi, 2019). TAM suggests that consumers who regard technology as useful are likelier to accomplish positive behavioral intentions (Venkatesh and Davis, 2000). Against this prediction, Sullivan and Kim (2018) showed that presence of trust and perceived value makes this relationship insignificant, as consumers rely more on these determinants in their decision-making. In this current *meta-analysis*, we expected perceived usefulness to mediate the relationship between determinants and online grocery purchase intention.

2.3.2. Attitude

Attitude refers to a learned tendency to respond to a stimulus with favorable or unfavorable behavior. A more favorable attitude toward a behavior leads to increased engagement in that behavior (Fishbein and Ajzen, 1975). Attitude influences a consumer's behavior toward an object and thus leads to positive or negative actions (Hasan, 2010). In the literature, attitude is widely considered to be a predictor of behavioral intentions in the TAM and TPB (Ajzen, 1991; Davis et al., 1989). In these models, attitude was used as a mediator to explain the mechanism behind a consumer's behavioral intention; thus, we adopted attitude as a mediator.

When consumers are unfamiliar with new technologies, their attitudes are not developed or strong and, unlike experienced consumers, do not guide their behavior (Karahanna et al., 1999). In emerging contexts, such as online grocery shopping, consumers have yet to form strong attitudes toward online services. For example, some consumers newly tested online grocery shopping during the COVID-19 pandemic. It can be assumed that attitude did not have as strong an impact on these consumers' shopping behaviors as it had for consumers who had been using these services for a longer time.

In the context of online grocery shopping, a consumers' attitude playing a mediating role in their behavioral intentions is widely accepted for several determinants (Hansen et al., 2004, Loketkrawee and Bhatiasevi, 2018). Difficulties and risks related to online grocery shopping have led to consumers' cognitive processing in forming beliefs toward the attributes of online grocery shopping and consequently their attitude toward online grocery services (Hansen, 2008). We argue that attitudes toward online grocery shopping should mediate the relationship between determinants and one's intention to shop online.

2.4. Moderators

Moderating effects were examined to spot novel insights and evaluate the impacts of the methodologies used in the included studies.

2.4.1. Covid-19

In light of greatly increased online grocery sales, the COVID-19 pandemic has caused a major shift in grocery shopping behavior (Forbes, 2020; McKinsey, 2020). The impacts of lockdowns and quarantines on consumers' behaviors are indisputable; however, from a future perspective, it is necessary to evaluate whether the change is temporary.

According to Hand et al. (2009), situational factors may explain consumers' increased online grocery shopping behavior. Because the pandemic has forced consumers to change their old habits, it can be questioned whether the growth of the online grocery sector is only a result of this compulsion and whether old habits will return after the pandemic. However, some of the adopted behaviors, such as online shopping, might become a new normal (Dwivedi et al. 2020; Roggeveen and Sethuraman, 2020). Similarly, we can expect remote work and studying online to increase considerably after the pandemic. Therefore, it is essential to address the moderating effect of COVID-19 on the effects influencing online grocery purchase intentions. In this meta-analysis, the assumption is that COVID-19 is an independent factor that has increased online sales, including for groceries, and that the recent shift in consumer behavior is a result of specific circumstances. We argue that COVID-19 outperforms the impact of many other determinants.

2.4.2. Control variables

We controlled for the influence of methodological variables on the examined relationships. Including control variables helps to evaluate the influence of the methodological and procedural choices of studies on outcomes (Lipsey, 2003). We examined the impacts of a publication's form, year, sample sources, and study design on focal relationships. Publication forms were allocated as published and unpublished studies. Published studies mean that the articles were published in scientific journals. Studies with significant effects tend to be published more often (Hunter and Schmid, 2004). Publication year was addressed as a continuous variable and was included because counterintuitive results are usually published first rather than later (Hunter and Schmid, 2004). The sample source was addressed between studies relying on student samples and nonstudent samples. As a result of more homogenous respondents, student samples often produce stronger effect sizes and lower error variances (Geyskens et al., 2009).

Table 3
Coding procedure.

Variable	Moderator Description	Coding
COVID-19	Was the sample collected before or during the COVID-19 pandemic?	0 = before (N = 9) 1 = during (N = 42)
Control Variables		
Publication Form	Type of publication form: published scientific journal articles, and unpublished conference papers, dissertations, or theses	0 = published (N = 32) 1 = unpublished (N = 15)
Publication Year	Year the study was published	continuous variable
Sample Source	A dummy variable indicates if the study used a student or nonstudent sample.	0 = student sample (N = 13) 1 = nonstudent sample (N = 34)

3. Methodology

3.1. Data collection and Coding procedures

The objective of our literature search was to identify articles addressing online grocery shopping. The data collection began by performing a search with keywords such as ‘online grocery,’ ‘e-grocery,’ ‘internet grocery,’ and ‘online food retailing.’ ABI/INFORM, Scopus, Proquest Central, Emerald, EBSCO Business Source Premier, Proquest Dissertation Database, and Google Scholar were used to screen relevant studies for this *meta-analysis*. The journals and reference lists of the collected studies were manually explored. In the case of missing data, we requested it from the authors. We also contacted the authors to ask for unpublished studies. Both published and unpublished studies were included.

Regarding inclusion criteria, studies had to provide empirical quantitative findings, the information needed to calculate effect sizes, and sample sizes. Studies had to consider online grocery shopping and measure purchase intention and its determinants. When qualitative studies, review papers, and studies without required data were excluded, our dataset included 50 articles published between 2004 and 2021 (see [Supplementary Materials](#)).

Two independent coders coded the moderator variables according to the definitions presented in [Table 3](#). The coding of the COVID-19 moderator was based on the data collection period. If this information was missing, the authors were contacted. Coding consistency was sufficiently high (agreement rate greater than 95%). Differences in coding were solved through discussion.

3.2. Effect sizes

We used Pearson correlation coefficients (r) as effect sizes. If the studies provided other statistics, they were converted to correlations ([Hunter and Schmidt, 2004](#)). In the case that a study provided only regression coefficients, [Peterson and Brown’s \(2005\)](#) protocol was adopted to transform the results into effect sizes. In samples that contained two or more correlations for the same construct, we averaged these correlations and reported the data as a single study ([Hunter and Schmidt, 2004](#)). We collected 283 effect sizes from 50 samples of 47 articles and 20,538 respondents.

The random-effect approach was used to calculate the average correlations for each variable ([Hunter and Schmidt, 2004](#)). [Hunter and Schmidt’s \(2004\)](#) procedure was followed when correcting effect sizes in relation to reliability. Correlations were divided by the square root of the respective reliabilities of the constructs involved. The sampling error was adjusted by weighting the reliability-adjusted correlations by the sample size. To assess publication bias, [Rosenthal’s protocol \(1979\)](#) was adopted. We also calculated the fail-safe N (FSN) for all attributes. FSN presents the number of studies that would decrease the significance of relationships below the threshold ($p < 0.05$) if studies had null results. If the FSN was greater than $5 \cdot k + 10$ (where k represents the number of effect sizes), the results were considered robust.

3.3. Structural equation modeling

Structural equation modeling (SEM) was used to test the mediation effects. We used a correlation matrix (see [Table 4](#)) with a harmonic mean of all sample sizes as input in IBM SPSS Amos 26. Using harmonic means produces more conservative results than arithmetic means ([Viswesvaran and Ones, 1995](#)). Effect sizes with at least three correlations with all other variables were included in the analysis. Error variances were set to 0 according to the logic of [Iyer et al. \(2020\)](#) because single indicators were used, and measurement error was already considered in the mean effect size calculation.

Enjoyment and entertainment could not be individually included in the SEM model because of the small number of effect sizes, so they were aggregated into one determinant (i.e., positive emotions) and its impact was addressed in the SEM model.

Table 4
Correlations among latent constructs.

	1. Perceived usefulness	2. Ease-of-use	3. Perceived risk	4. Positive emotions	5. Social influence	6. Attitude	7. Purchase intention
1. Perceived usefulness	1	16	8	4	7	10	31
2. Ease-of-use	0.679	1	7	5	6	10	26
3. Perceived risk	0.064	-0.028	1	4	5	3	15
4. Positive emotions	0.516	0.397	0.108	1	3	3	11
5. Social influence	0.486	0.37	0.041	0.373	1	9	17
6. Attitude	0.662	0.32	-0.119	0.448	0.690	1	23
7. Purchase intention	0.54	0.426	0.045	0.364	0.441	0.630	1

Note: The harmonic sample mean of sample sizes across all collected effects is 1795. Entries in the lower half illustrate sample-weighted reliability-adjusted correlations, and the upper half the number of effect sizes.

3.4. Moderator analysis

Three moderators were coded as dummy variables, and the publication year of the studies was measured as a continuous variable. A moderator analysis was run only for relationships with an adequate number of effect sizes (Samaha et al., 2014). Favorable conditions for a moderator analysis were evaluated in light of the chi-squared test of homogeneity and I^2 presenting the variance of the effect size distribution. The chi-squared values were significant for all measured relationships, and I^2 -values exceeded the 75% rule of thumb (Rana and Paul, 2020). The conditions for the moderator analysis were found to be appropriate. A random-effects regression analysis with reliability-corrected correlations of dependent variables was performed using CMA 3 software to test the influence of moderators (Hunter and Schmidt, 2004).

4. Results

4.1. Descriptive statistics

As presented in Table 5, all the calculated effects were significant ($p < 0.01$), despite perceived risk ($rc = 0.045$). The sample-weighted reliability-adjusted average correlations (rc) of perceived usefulness ($rc = 0.540$), ease-of-use ($rc = 0.426$), trust ($rc = 0.449$), price value ($rc = 0.277$), positive emotions ($rc = 0.364$), subjective norms ($rc = 0.447$), social influence ($rc = 0.360$), and attitude ($rc = 0.630$) indicate a positive influence on online grocery purchase intentions. Thus, these determinants are shown to increase online grocery purchase intentions.

Interestingly, price value had the lowest impact on consumers' intentions of significant determinants. The weaker influence indicates that the higher costs of online groceries, such as delivery fees and charges for collecting products, do not play as important a role as is generally assumed (Singh, 2019).

Attitude and perceived usefulness had the strongest effects on purchase intentions. We also examined determinant–mediator relationships for these constructs, which were significant. This indicates a need to test the mediation effects in the SEM.

4.2. Meta-Analytic SEM results

The SEM results are presented in Table 6 and Figure 2. First, we examined the direct effects of determinants on online grocery purchase intention, perceived usefulness, and attitude. Our results reveal that perceived usefulness ($\beta = 0.219$; $p < 0.01$), ease-of-use ($\beta = 0.294$; $p < 0.01$), perceived risk ($\beta = 0.139$; $p < 0.01$), social influence ($\beta = -0.102$; $p < 0.01$), and attitude ($\beta = 0.485$; $p < 0.01$) have significant effects on online grocery purchase intention. However, the impact of positive emotions ($\beta = 0.005$; ns) was not significant.

Second, we examined the direct impact of ease-of-use, perceived risk, social influence, and positive emotions on perceived usefulness. Ease-of-use ($\beta = 0.512$; $p < 0.01$), social influence ($\beta = 0.209$; $p < 0.01$), and positive emotions ($\beta = 0.230$; $p < 0.01$) significantly influence perceived usefulness. The perceived risk–perceived usefulness relationship ($\beta = 0.0045$; ns) was found to be nonsignificant.

Third, the direct effects of perceived usefulness ($\beta = -0.311$; $p < 0.01$), ease-of-use ($\beta = -0.311$; $p < 0.01$), perceived risk ($\beta = -0.197$; $p < 0.01$), social influence ($\beta = 0.484$; $p < 0.01$), and positive emotions ($\beta = 0.104$; $p < 0.01$) on attitude were all found to be significant.

We expected that both perceived usefulness and attitude would mediate the paths to online grocery purchase intention. Regarding the mediating effects through perceived usefulness, the mediating effect was confirmed. The indirect effect of ease-of-use ($\beta = 0.316$; $p < 0.01$), perceived risk ($\beta = 0.035$; $p < 0.05$), social influence ($\beta = 0.207$; $p < 0.01$), and positive emotions ($\beta = 0.248$; $p < 0.01$) on online grocery purchase intention were statistically significant. The indirect effects on online grocery purchase intention because of attitude were significant for perceived usefulness ($\beta = 0.321$; $p < 0.01$), ease-of-use ($\beta = 0.176$; $p < 0.01$), perceived risk ($\beta = -0.077$; $p < 0.01$), social influence ($\beta = 0.429$; $p < 0.01$), and positive emotions ($\beta = 0.262$; $p < 0.01$). The meta-analytic SEM results suggest that

Table 5
Descriptive statistics and correlation of predictors with online grocery purchase intention.

Determinants of online grocery purchase intention	Number of raw effects	Total N	Sample-weighted reliability-adjusted r	−95% CI	+95% CI	Q-statistic for Homogeneity test	p	I^2	FSN
Perceived usefulness	31	10,713	0.540**	0.417	0.643	1,196	0.000	97.909	7,877
Ease-of-use	26	8,517	0.426**	0.324	0.518	694	0.000	96.396	8,814
Positive emotions	11	2,842	0.364**	0.215	0.497	190	0.000	94.729	1,136
Risk	15	7,498	0.045	−0.109	0.197	564	0.000	97.519	100
Trust	9	3,969	0.449**	0.319	0.562	188	0.000	95.205	2,010
Price value	10	3,550	0.277**	0.145	0.398	152	0.000	94.01	664
Subjective norms	13	9,054	0.447**	0.346	0.537	376	0.000	96.807	5,714
Social influence	4	1,540	0.360**	0.138	0.548	85	0.000	95.311	218
Attitude	23	8,425	0.630**	0.517	0.722	1,472	0.000	98.505	8,811

Note: ** $p < 0.01$, Confidence intervals and FNSs were estimated with two-tailed tests. The table only presents predictors in which the effect sizes could be calculated.

Table 6
Meta-analytic SEM and mediation analysis results.

Independent Variable	→	Dependent Variable	Estimate	LCI	UCI	P
Direct Effects						
Ease-of-use	→	Perceived usefulness	0.512	0.475	0.545	0.001
Perceived risk	→	Perceived usefulness	0.045	0.015	0.077	0.005
Social influence	→	Perceived usefulness	0.209	0.176	0.243	0.001
Positive emotions	→	Perceived usefulness	0.230	0.196	0.264	0.001
Perceived usefulness	→	Attitude	0.597	0.560	0.638	0.001
Ease-of-use	→	Attitude	-0.311	-0.348	-0.277	0.001
Perceived risk	→	Attitude	-0.197	-0.222	-0.170	0.002
Social influence	→	Attitude	0.484	0.455	0.514	0.001
Positive emotions	→	Attitude	0.104	0.071	0.134	0.001
Ease-of-use	→	Online grocery purchase intention	0.294	0.245	0.346	0.001
Perceived risk	→	Online grocery purchase intention	0.139	0.102	0.174	0.001
Social influence	→	Online grocery purchase intention	-0.102	-0.150	-0.047	0.001
Positive emotions	→	Online grocery purchase intention	0.005	-0.037	0.046	0.833
Perceived usefulness	→	Online grocery purchase intention	0.219	0.174	0.266	0.001
Attitude	→	Online grocery purchase intention	0.485	0.442	0.531	0.001
Covariances						
Ease-of-use	<>	Perceived risk	-0.028	-0.072	0.019	0.247
Ease-of-use	<>	Positive emotions	0.397	0.345	0.446	0.001
Ease-of-use	<>	Social factors	0.370	0.323	0.422	0.001
Perceived risk	<>	Positive emotions	0.108	0.061	0.155	0.001
Perceived risk	<>	Social factors	0.041	-0.003	0.089	0.066
Positive emotions	<>	Social factors	0.373	0.324	0.421	0.001
Indirect Effects Through Perceived Usefulness						
Ease-of-use → Perceived usefulness → Online grocery purchase intention			0.316	0.274	0.356	0.008
Perceived risk → Perceived usefulness → Online grocery purchase intention			0.035	0.005	0.058	0.033
Social influence → Perceived usefulness → Online grocery purchase intention			0.207	0.180	0.237	0.006
Positive emotions → Perceived usefulness → Online grocery purchase intention			0.248	0.218	0.281	0.006
Indirect Effects Through Attitude						
Perceived usefulness → Attitude → Online grocery purchase intention			0.321	0.284	0.358	0.007
Ease-of-use → Attitude → Online grocery purchase intention			0.176	0.150	0.202	0.018
Perceived risk → Attitude → Online grocery purchase intention			-0.077	-0.116	-0.050	0.003
Social influence → Attitude → Online grocery purchase intention			0.429	0.387	0.470	0.008
Positive Emotions → Attitude → Online grocery purchase intention			0.262	0.231	0.291	0.014

Note: The p-values of mediation analysis were based on 95% likelihood-based confidence intervals and the saturated model.

attitude mediates these relationships.

However, the direct effect of perceived risk was considerably stronger than the indirect effects through mediators. Also, the indirect effect of social influence was negative, and the indirect effect was positive, which overruled the total negative effect. The nonsignificant direct effect of positive emotions on online grocery purchase intention, and significant indirect effects indicate full mediation.

Investigating mediation mechanisms in a meta-analysis helps to evaluate the roles of the determinants. In summary, significant mediating effects highlight the importance of perceived usefulness and attitude. Therefore, the impact of determinants on online grocery purchase intention is weaker than expected based on effect sizes.

4.3. Moderator analysis results

The moderator analysis aimed to address the impact of COVID-19 and the control variables.

All moderator variables were dichotomized despite an article’s publication year being treated as a continuous variable. [Table 7](#)

Table 7
Results of the moderator analysis.

	Perceived Usefulness	Ease-of-use	Risk	Positive Emotions	Social Influence	Price Value	Attitude
k	32	26	16	13	16	10	20
Moderators	β	β	β	β	β	β	β
COVID-19 pandemic	-0.194*	-0.125	0.160	-0.195	-0.018	-0.001	-0.302*
Sample source	0.231*	0.230	0.130	-0.158	0.187	0.133	0.002
Publication form	0.090	-0.180	-0.130	-0.043	-0.023	0.025	-0.015
Year	0.016	0.011	-0.001	0.026	0.002	0.0129	-0.006

Note: * p < 0.05

summarizes the results for the potential moderators of online grocery purchase intention by presenting the beta coefficients and effect sizes across the moderators.

4.3.1. Covid-19

Our findings confirm the moderating effect of COVID-19 on some determinants (see Table 7). The impact of COVID-19 is interesting because it seems to decrease the importance of some considerable determinants of online grocery purchase intention. Our findings indicate that perceived usefulness ($\beta = -0.194$; $p < 0.05$) and attitude ($\beta = -0.302$; $p < 0.05$) had a stronger impact on consumers' intentions before COVID-19. However, we did not examine significant moderating effects on ease-of-use, risk, positive emotions, or social influence. It seems that COVID-19 has decreased the importance of the strongest determinants of intention and, in this way, has influenced online grocery shopping behavior. This indicates that consumers have not used online grocery services during the pandemic because they perceive them as useful or have positive attitudes toward them, but because COVID-19 has forced them to adopt these services.

4.3.2. Control variables

Interestingly, our results regarding the moderating effects of control variables indicate that student samples produced weaker effect sizes on the relationship between perceived usefulness and online grocery purchase intention ($\beta = 0.231$; $p < 0.05$). We did not observe any other significant moderating effects.

5. Discussion

5.1. Theoretical contributions

Even though many studies about online shopping have been published, online grocery shopping is a relatively under-researched topic. Despite the enormous growth in online grocery sales, no *meta*-analytical framework has been developed. Therefore, this *meta*-analysis contributes to marketing and, specifically, retailing research by synthesizing data and presenting a conceptual framework for online grocery shopping based on 50 independent samples published between 2004 and 2021 with 20,538 respondents.

Previous studies have addressed online grocery shopping from various viewpoints. In this *meta*-analysis, we integrated constructs from the TAM, UTAUT/UTAUT2, and TPB and provided a comprehensive model of online grocery purchase intentions. Also, we complemented these models by including determinants, such as positive emotions and perceived risk, often added to these models by researchers in our *meta*-analytical framework. This arrangement contributes to previous research by synthesizing the constructs from these three models. Different perspectives complement each other, but our analysis also reveals that some determinants of these models are conceptually similar, which highlights their critical importance.

First, the results of the effects influencing online grocery purchase intentions offer empirical generalizations across different research streams. We found that perceived usefulness, ease-of-use, positive emotions, trust, price value, subjective norms, social influence, and attitude positively affect online grocery purchase intentions. The impact of perceived risk was found to be insignificant. Interestingly, price value had the lowest impact on these determinants. In previous studies, a perceived high price has been shown to play an important role in choosing online grocery retailers (Singh and Rosengren, 2020). Although the effect was significant, the other determinants seemed to outperform the impact of price. Social aspects are defined as special features of food retailing (Hansen et al., 2004). In previous research, the effect of social influence on brick-and-mortar stores was undisputable (Argo and Dahl, 2020). We contribute to this research by examining these effects in the online grocery context and by presenting how social influence affects consumers' online grocery purchase intentions.

Second, we contribute to existing research by confirming the mediating effects of attitude and perceived usefulness on the relationship between attributes and online grocery purchase intentions. We followed the logic of the TAM and examined the mediating effects of perceived usefulness and consumers' attitudes. Our results indicate that they mediate the relationship between determinants and online grocery purchase intentions. Interestingly, the indirect effects are relatively strong, which indicates the critical roles of perceived usefulness and attitude in online grocery purchase intentions. The importance of determinants should be evaluated in light of these strong mediating effects.

Third, examining the moderating effect of COVID-19 answers the call for research addressing short- and long-term changes in consumer behavior during the pandemic (Ha and Harris, 2020; Roggeveen and Sethuraman, 2020). Our findings underscore the impact of the pandemic on the perceived usefulness of and attitudes toward online grocery shopping. We show, for the first time, that consumers have not shopped for groceries online during the pandemic because they perceive these services as useful, or have a positive attitude toward them, but because they have been forced to purchase groceries online. These results help to explain the mechanisms behind enormous growth during the pandemic but also forecast post-Covid trends.

The post-Covid situation remains unclear, and some adopted shopping behaviors might become the new normal (Dwivedi et al. 2020; Roggeveen and Sethuraman, 2020). However, if the importance of these determinants increases again after the pandemic, online grocery sales might decrease if retailers do not influence perceived usefulness and shape consumers' attitudes toward online grocery services.

Interestingly, we found evidence that the effect sizes of positive emotions, social influence, and price value remained fairly at the same level as before the COVID-19 pandemic. Thus, the pandemic did not strongly affect these determinants. Therefore, it can be assumed that their effects will remain at the same levels in post-pandemic situations.

In previous *meta*-analytical research, increased consumer expertise with the internet, represented by the publication year, has been

shown to influence perceived e-service quality (Blut et al., 2015). However, the nonsignificant results of a publication year's moderating effects rule out this explanation and confirm our observations related to the COVID-19 pandemic.

Fourth, we evaluated the results of previous research in light of the control variables and presented the impact of methodological decisions. Our results indicate that the sample source has slight effects on the relationships of perceived usefulness and online grocery purchase intention, and ease-of-use and online grocery purchase intention. Nonstudent samples generated stronger effects. Besides these, there were no significant moderating effects; therefore, no strong impact of the control variables can be detected.

5.2. Managerial implications

Online grocery sales have increased rapidly in recent years; hence, consumers' online grocery shopping behavior has been of interest to food retailers. This current *meta*-analysis clarified the mechanisms of online grocery purchase intentions and guides online retailers in improving their online grocery services. Our insights can help retailers recognize key features of their online grocery services and better serve their customers (see Table 8).

First, we presented several significant determinants that influence online grocery purchase intentions. These findings help allocate resources and develop online grocery services. Prior research has highlighted the role of the social elements of food as a key feature of grocery shopping (Hansen et al., 2004). Our findings confirm this relationship, and thus, we encourage retailers to include social elements in their online grocery stores. For example, allowing consumers to share their shopping baskets or favorite products and recipes might generate a positive social influence. Also, efficient interplay with social media platforms may offer novel opportunities from the perspective of social food shopping.

Our findings indicate that several determinants outperform the impact of price value. Even though the influence of price value is significantly weaker than that of several determinants, our findings demonstrate a clear positive relationship with online grocery purchase intentions. Because increasing sales volume offers cost savings, the growth of the online grocery sector naturally boosts the positive impact on purchase intentions.

Our findings show that perceived usefulness and attitude work as mediators between determinants and online grocery purchase intentions. Based on their strong impacts, we highlight their importance as key triggers of online grocery purchase intentions. Thus, we argue that investments in these constructs could pay off directly in the increase in purchase intentions.

Third, the COVID-19 pandemic introduced online grocery shopping to buyers. Because this has partly been inevitable, the challenge is to retain these customers in the post-pandemic world. Our results revealed that COVID-19 decreased the importance of the perceived usefulness of and attitudes toward online grocery purchase intentions. In light of these observations, we encourage retailers to focus specifically on these determinants because it can be assumed that their importance might increase again after the pandemic. However, post-COVID-19 development in this field is still unclear; therefore, retailers need to stay conscious of current circumstances.

5.3. Future research and study limitations

The main limitations of this *meta*-analysis are related to the lack of existing studies addressing the studied relationships. The effect size of some relationships was low, resulting in situations where effects could be examined. However, this provides potential research topics for future studies (see Table 9). Our synthesis allows us to recommend the following areas for further study.

Although our results provide several determinants of online grocery purchase intentions, there is a lack of studies concerning the barriers to online grocery shopping adoption. Therefore, more research is needed to address the factors that decelerate the adoption process. According to McKinsey's (2020) report, most consumers are not satisfied with online grocery shopping services. Our results do not provide clear explanations for this; thus, future research should evaluate the mechanisms of this dissatisfaction.

Table 8
Managerial implications.

Issue	Managerial Implications
Determinants of online grocery purchase intention	<ul style="list-style-type: none"> • We present several significant determinants that influence consumers' attitudes and purchase intentions toward online grocery shopping. In light of these findings, retailers should consider how their services can be developed. • Online grocery's main difference from other online retailing formats is related to the nature of food as a product. In the previous literature, social influence has been identified as a special feature of food retailing (Hansen et al., 2004). Our results confirm these findings; therefore, retailers need to consider how to include social elements in online shopping experiences. • The impact of price on purchase intentions was identified as significant but distinctly weaker than most of the determinants. Increasing sales volume might decrease retailers' costs and improve price value.
Attitude toward online grocery shopping and perceived usefulness	<ul style="list-style-type: none"> • Attitude and perceived usefulness strongly guide consumers' decision-making. Based on the significant mediating influence of these on the examined relationships, we encourage retailers to find ways to influence these mediators.
COVID-19 pandemic	<ul style="list-style-type: none"> • The circumstances during the COVID-19 pandemic have forced consumers to make themselves familiar with new online grocery shopping services. However, the challenge is to retain these customers after the pandemic. • COVID-19 has decreased the importance of perceived usefulness and attitudes toward online grocery purchase intentions. However, contradictory development can be assumed in the post-COVID world. We encourage retailers to allocate resources to respond during this transition.

Table 9
Directions for further research.

Issues	Research Directions
Measured Relationships	<ul style="list-style-type: none"> • Our findings present determinants influencing online grocery purchase intentions. However, our results do not provide an answer to consumers' low satisfaction with online grocery services. It would be beneficial to examine the mechanisms behind dissatisfaction and the barriers to online grocery shopping adoption. • The impact of offline stores on consumer attitudes toward online grocery services should be explored. Future studies should address smooth channel integration and its possible benefits. • Our results indicate a significant moderating effect of the COVID-19 pandemic on consumer attitudes, perceived usefulness, and online grocery purchase intentions. However, post-Covid research is needed to address development after the pandemic. • The results of homogeneity tests are not fully explained by our moderator analysis. Thus, future studies should test new moderators. • Existing research did not allow us to compare the moderating effects of click-and-collect versus delivery services. This should be explored in future studies.
Mediation Mechanisms	<ul style="list-style-type: none"> • Our results confirm the mediating effects of attitude and perceived usefulness. However, other mediators, such as brand-related mediators, should be explored. For example, future studies could investigate brand equity and brand experience as mediators.
Methodological Decisions	<ul style="list-style-type: none"> • The barriers to online grocery shopping adoption remain partly unclear. In the future, qualitative studies focusing on these factors might clarify the mechanisms behind them. • As technological development continues and smart appliances has become more common, longitudinal studies are needed to follow this development from a consumer perspective.

Our results indicate a strong impact of attitude on online grocery purchase intentions. Although the dyadic relationship between online and offline stores has been widely examined in previous research, this impact has not been considered in the grocery sector. Thus, further studies should include the effects of offline stores and broaden perspectives on multichannel management and integration in the grocery context.

Our *meta*-analysis addressed the impact of COVID-19 on consumers' online grocery purchase intentions. We provided insights about recent trends and reflected on possible post-COVID developments. However, future studies should investigate these effects in the post-COVID environment. Thus, we call for further research to extend our understanding of the new normal.

Our moderation analysis did not fully explain the high values for some relationships in the homogeneity tests. The lack of existing studies does not allow us to test particular moderating effects. For example, future studies could compare different formats of online grocery shopping, such as click-and-collect versus delivery services. As the literature builds more evidence, these effects can be addressed in *meta*-analytical studies.

We confirmed the significant mediating effects of perceived usefulness and attitude. However, we encourage researchers to test other mediators that could not be included in our model because of the lack of studies. For example, brand-related mediators, such as brand experience and brand equity, should be explored.

From a methodological perspective, we encourage future studies to adopt qualitative research methods to gain a deeper understanding of the barriers hampering online grocery shopping adoption. By using qualitative methods, researchers can provide a deeper understanding of the mechanisms influencing the entire process of adopting online grocery shopping.

The recent evolution of online grocery stores has been rapid. As a result of technological development, updated research about new technologies is needed. Artificial intelligence will facilitate our daily lives, and smart appliances might be able to communicate directly with online grocery stores, for example, based on a fridge's contents. This might reshape the entire grocery industry and create a need for novel research.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tele.2022.101839>.

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