Analyzing Academic Discourse Evolution on Consumer Behavior and covid-19 Using Topic Modeling

Victor W. Bohorquez-Lopez
Ph. D. in Business Administration
Professor and researcher, Pontificia Universidad Católica Madre y Maestra
Santo Domingo, Dominican Republic
Grupo Iberoamericano de Marketing
Author's role: intellectual, experimental and communicative

Manuela Gutiérrez-Leefmans
Ph. D. in Business and Management
Associate Professor, Universidad de las Américas Puebla
San Andrés Cholula, Mexico
Author's role: intellectual and communicative

ABSTRACT: The COVID-19 pandemic brought changes in consumers’ habits derived from initial confinement in the first year and a second year characterized by an attempt to return to activities under the “new normal” label. Several literature reviews that summarize existing research on consumer behavior and the pandemic have recently emerged. Many of them have a regional or country-specific focus. Others emphasize certain factors under study at the beginning of the pandemic. In contrast, this study explores the most salient topics found in literature in 2020 from those found in 2021 using a global Scopus database showing the evolution of the academic discourse on consumer behavior as the pandemic developed. Interestingly, some differences show consumers’ evolution throughout the pandemic, seen through the eyes of researchers. Topic modeling highlights the main topics under study in both years. Results show the relevance of four major topics that differ from one year to another. Research on online consumption, however, remains equally important in both years. We propose a theoretical model of consumer behavior research that aims to help consumers understand themselves, managers address strategies accordingly, and policymakers regulate the major issues brought by the pandemic.

KEYWORDS: Literature review, marketing trends, online consumer, pandemic, topic modeling.

Introduction

The COVID-19 breakout forced confinements globally that brought changes in people’s lifestyles and priorities. As a result, consumers experienced changes in their preferences, and researchers started following this interesting and unprecedented shift. Topics commonly discussed in marketing journals in the past few years related to customer satisfaction, marketing innovation, branding strategy, and consumer behavior (Nicolas et al., 2020). However, marketing trends were also altered following the changes in consumer habits.

Due to country-specific waves in terms of the pandemic development, a local study could seem reasonable. However, there are clear general trends
that show changes in consumer behavior that are worth studying. In this work, we show the evolution of general research topics highlighting the shift between the first and the second year of the pandemic. Although many activities stayed relatively similar (i.e., restrictions in education in some contexts), some differences have been detected between 2020 and 2021. The former was filled with anxiety, fear of the unknown, and a search for a healthier lifestyle, while the latter showed consumers looking for comfort and experimenting with postponed activities again as they began to go out following safety measures. Therefore, the main novelty of this study is to separate the most salient topics found in academic literature in 2020 from those found in 2021, showing the evolution of the academic discourse on consumer behavior as the pandemic developed in a theoretical model. Scopus database was chosen to carry out this study because it covers more journals than Web of Science, thus providing access to a larger number of articles (Mongeon & Paul-Hus, 2016).

We used topic modeling to highlight the main topics under study in both years since it allows quantitative analysis of large amounts of textual data, which is why it has been applied to carry out literature reviews in various fields (Upreti et al., 2016). This technique uses unsupervised machine learning to extract terms with a consistent meaning (called topics) from the document corpus, automatically grouping those with the most semantic links (Rossetti et al., 2016). Being an unsupervised model, it is convenient because it does not require previous annotations or labeling of documents. That is, the themes will arise from the statistical structure of the data in the documents and words analyzed (Sun & Yin, 2017).

COVID-19 has affected the whole landscape around the world. This study contributes to analyzing this situation by exposing trends derived from the pandemic crisis. From a marketing-related perspective, this is relevant as companies should be aware of these issues. Consumers have shifted certain habits, including information consumption and psychological changes. As a result, consumption has changed, making researchers question specific business models’ sustainability. In addition, supply chains have suffered. Hence, the peculiarity of this crisis, which marketers need to manage. This study helps consumers understand the changes our society has gone through during this critical period.

The study presents a summary of the salient literature focused on consumer behavior, first as an individual and second as a subject of study for marketing and business during the COVID-19 pandemic. This is followed by an explanation of the methodology used and topic modeling. Our results highlighting the differences among studies in the first and second years of the pandemic are discussed in the following section. We end by presenting a theoretical framework and important managerial and policy implications.

**Literature review**

**Consumer behavior and COVID-19 literature**

There is a vast amount of articles that relate consumer behavior to COVID-19. Articles vary from consumer shopping behavior (Eger et al., 2021) to psychological factors (Di Crosta et al., 2021) and even paradigm shifts (Mehta et al., 2020). The primary health concern is reflected in the number of studies that address dietary issues (Sidor & Rzymski, 2020) and health-related risks (Shin & Kang, 2020). As a result, we find a good amount of literature studying food consumption.

The carbon footprint has also been a subject of concern for the last two decades, and the effect of the pandemic on environmental issues is no exception. Studies that look into waste management (Vanapalli et al., 2021) and the impact of food wastage (Jribi et al., 2020) are common.

Previous literature reviews on the pandemic have implemented different approaches to address consumer behavior. An example is the systematic literature review of Cruz-Cárdenas et al. (2021), who relate COVID-19 and consumer behavior to technology and society. These authors do a descriptive, bibliometric, and co-occurrence analysis and find that the measures adopted by governments, technology, and social media stand out as external factors. According to the authors, technological and digital formats mark consumer behavior; hence, firms must incorporate digital transformations in their process. Some other reviews warn us about the general patterns that consumers have been producing since the COVID-19 pandemic began. These include attitudes and habits such as spending or purchasing patterns (Di Crosta et al., 2021; Satish et al., 2021).

To differentiate studies, some authors use the resource of generational cohorts (Eger et al., 2021; Jílková & Králová, 2021) or significant historical milestones (Zwanka & Buff, 2021). These studies try to emphasize the relevance of looking at consumers from different points of view and not generalizing, as could happen when faced with a crisis. We also see a stream of literature focused on the consumer as an individual. However, there is an important relationship with the business impact of COVID-19. Many studies emphasize the need for niche businesses to respond to current changes in consumer behavior.
Marketing and business-related covid-19 literature

Marketing trends have evolved as a natural consequence of consumer behavior changes during the pandemic. Some studies on marketing trends emphasize the effects of covid-19, which may disrupt marketing strategies and policies (Hoekstra & Leeflang, 2020). Maulana (2020) does an integrative literature review focusing on research trends in marketing science before the covid-19 outbreak. This author proposes a research agenda highlighting social media and social and cause-related marketing studies concerning the pandemic.

On the one hand, supply chain disruption in the pandemic era is a key issue explored by diverse authors (Sarkis, 2021). Different industries were and continue to be affected by this problem, particularly the food industry, as evidenced by the different studies on such matters (Hobbs, 2020). On the other hand, the increase in online activities and digitalization is an important research topic with relevant implications for individuals and industries. A large number of studies find that e-commerce has grown and will continue to do so, thanks to the increase in global online activity and home office approaches. As a result, we find a large number of studies addressing the challenges of the online channel (Jílková & Králová, 2021).

Tourism is an industry that has been particularly impacted by the initial confinement and the continuous regulations and fears that prevent people from traveling—studies such as Shin and Kang (2020) stress technology’s usefulness in facing such challenges. An important change related to technology is the study of how people search for information (Bento et al., 2020). This is an essential feature of consumer behavior relevant to governments and businesses. Paakkari and Okan (2020) emphasize how health literacy is an underestimated problem. For companies, business intelligence data that helps to understand search patterns and trends is vital in the current changing environment.

Moreover, we need to consider the amount of time people spend online derived from the covid-19 pandemic. This is known as the “attention economy,” a recent but well-researched topic in 2020. Whether consumers look for
information and make decisions following influencers or have other strategies is a topic that has also attracted researchers’ attention.

Therefore, in a world of literature, this study aims to answer the following research question: Which are the salient topics addressed in the consumer behavior literature during the pandemic, and how have they changed?

The use of surveys among researchers is common (Di Crosta et al., 2021; Eger et al., 2021; Gu et al., 2021; Jílková & Králová, 2021; Mehta et al., 2020; Satish et al., 2021). Others have used secondary data, such as the work of Hoekstra and Leeflang (2020) and Zwanka and Buff (2021). The number of citations can measure the impact of research. Table 1 summarizes the most cited articles related to consumer behavior and COVID-19. By looking at the information in this table, it is visible that secondary data and surveys are still the most common data collection methods, only one study conducts an experiment, and few works adopt online panel data.

Table 1.
Most cited consumer behavior, marketing and COVID-19 related literature.

| Author and year | Title | Methodology | Focus and limitations |
|-----------------|-------|-------------|-----------------------|
| Hobbs (2020)    | Food supply chains during the COVID-19 pandemic | Secondary data and commentary (special issue) | Potential supply-side disruptions to food supply chains are assessed, including labor shortages, disruptions to transportation networks, and “thickening” of the Canada-United States border concerning the movement of goods. |
| Donthu and Gustafsson (2020) | Effects of COVID-19 on business and research | Introduction to the special issue | A global effort to address some pandemic-related issues affecting society. 13 papers cover different industry sectors (e.g., tourism, retail, higher education), changes in consumer behavior and business ethics, issues affecting society. 13 papers cover different industry sectors. |
| Sidor and Rzymski (2020) | Dietary choices and habits during the COVID-19 lockdown: Experience from Poland | Cross-sectional online survey | The study highlights that a lockdown imposed to contain an infectious agent may affect eating behaviors and dietary habits in Poland. |
| Sheth (2020)    | Impact of COVID-19 on consumer behavior: Will the old habits return or die? | Secondary data | Consumers are learning to improvise and learn new habits. |
| Paakkari and Okan (2020) | COVID-19: Health literacy is an underestimated problem | Secondary data | Health literacy should be seen regarding social responsibility and solidarity. Concerned with ethics of sharing misleading and false information about SARS-COV-2. |
| Laato et al. (2020) | Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach | Structural equation modeling | Investigates behavior when fears of consumer market disruptions started circulating. |
| Allington et al. (2021) | Health-protective behavior, social media usage, and conspiracy belief during the COVID-19 public health emergency | Linear probability models using questionnaire surveys of social media use | Restricted to UK residents. Concerns regarding the spread of COVID-19 conspiracy theories on social media. |
| Pantano et al. (2020) | Competing during a pandemic? Retailers’ ups and downs during the COVID-19 outbreak | Secondary data | Synthesize the challenges that retailers are facing during the COVID-19 emergency and provide suggestions. |

(Continues)
Focus and limitations

Investigate Italian public perceptions of health
Implications on the consumer perception for trans
Methodology
- Reducing perceived health risk to at
- Beyond panic buying: consumption dis
The psychological causes of panic buying following a health crisis
Reducing perceived health risk to attract hotel customers in the COVID-19 pandemic era: Focused on technology innovation for social distancing and cleanliness
Beyond panic buying: consumption displacement and COVID-19
The impact of COVID-19 lockdown on food priorities. Results from a preliminary study using social media and an online survey of Spanish consumers
Evidence from internet search data shows information-seeking responses to news of local COVID-19 cases
A Preliminary Evaluation of the Public Risk Perception Related to the COVID-19 Health Emergency in Italy
Panic buying in the COVID-19 pandemic: A multi-country examination
Supply chain sustainability: learning from the COVID-19 pandemic
Impact of COVID-19 on Food Behavior and Consumption in Qatar

Under an environmentally imposed constraints point of view, the authors examine behaviors during each of three phases: reacting, coping, and longer-term adapting.
Applied in Tunisia. Determine the impact of COVID-19 lockdown on Tunisian consumer awareness, attitudes, and behaviors related to food wastage.
Implications on the consumer perception for transitioning towards a circular economy. Complexities of plastic waste management enhanced by COVID-19.
Review, identify, and synthesize the psychological causes of panic buying.
Examine the impact of expected interaction and expected cleanliness on perceived health risk and hotel booking intention.
Evaluate consumption displacement, the shift in consumption that occurs when consumers experience a change in the availability of goods, services, and amenities to which they are accustomed as the result of an external event.
Spanish consumers. Impact of the COVID-19 health crisis on people’s interests, opinions, and behavior towards food.
Examine information-seeking responses to the first COVID-19 case public announcement in a state of the U.S. Event study framework for all U.S. states.
Investigate Italian public perceptions of health risk. For this purpose, a questionnaire.
Multi-country setting including the U.S., China, India, and Pakistan. Study of consumers’ panic buying behaviors using the stimuli-organism-response model and the competitive arousal model.
Provide research guidance for investigating sustainability in supply chains in a post-COVID-19 environment.
Restricted to Qatar. Investigates the immediate impacts of COVID-19 on Qatari consumer awareness, attitudes, and behaviors related to food consumption.

not talk about the topic, to 100%, when the document talks exclusively about the topic (Debortoli et al., 2016).

The first step has been to determine the keywords to use in the search, for which we have considered the terms “consumer” and (“behavior” or “behaviour”) and “COVID-19”, excluding articles published in 2022; obtaining a total of 928 scientific articles with these keywords from January 2020 to December 2021. All abstracts were extracted from Scopus, generating a BibTex file, and then uploaded into the R software for a pre-processing step. The pre-processing step is needed to clean the abstracts by removing words used in the search, as well as other words that do not contribute to the discussion, such as years, and
names of publishers, among others. In this step, we have also discovered the best number of topics (k) by using a simulation with different values, from 2 to 50, obtaining k = 4 as the best option. The following step has been to apply the LDA algorithm by year of publication, where topics were suggested by the data rather than predefined by the researchers (Schmiedel et al., 2019) and the abstracts corresponding to the same year were grouped to find the most used words by year. The last step has been to label the topics based on the most important words to propose a theoretical model (figure 1).

**Results**

After applying the topic modeling technique with a value of k = 4, we can see in figure 2 the top terms that are most common within each topic using the per-topic-per-word probabilities called “beta.” It is important to note that the scales on the X axis for the beta are not the same for the different topics. The beta values for topic 4 are higher than for the other topics, indicating that the words in topic 4 are more likely to appear in that topic than in other topics.

To analyze how much literature is associated each year with each topic, we used the “gamma” metric, which can be understood as the annual probability per topic. For example, 2020 and 2021 have a high presence of topic 4, between 70 and 75%, while in 2020, topic 1 has an occurrence of little more than 20%, and in 2021 topics 2 and 3 have an occurrence of about 10% (figure 3). It should be noted that it is not that topic 1 does not have a presence in 2021, nor topics 2 and 3 in 2020, but that its presence is minimal, around 5% or less.

Figures 2 and 3 show an evolution of the topics studied over time, where we can see that topic 4 is the most important and recurrent during 2020 and 2021. However, the other themes show a change in the subject investigated in the period analyzed. To propose a theoretical model, we have assigned an appropriate label according to the most important words of each topic. Figure 4 shows the theoretical model, where we can mention four blocks: (i) pandemic moves consumption online, covering both years, indicating that COVID-19 impacts consumer behavior accelerating the migration to online channels; (ii) lockdown due to coronavirus impacts people interaction, in 2020 the health restrictions reduced traditional interactions among people; (iii) increase protection to maintain operations, in 2021 organizations transformed to keep working; (iv) sustainability of consumption and current business models, as in 2021 was critical to analyze the better way to consume what was needed as well as to be sustainable to ensure survival, especially for small businesses.

**Discussion**

It is important to note that although most cited articles refer to supply chain issues, health concerns, information consumption, and psychological effects during the pandemic, the topic modeling analyzed presented here highlighted slightly different salient research areas. For example, health concerns are related to topic 2 (increment...
lockdown due to COVID-19 has caused several changes in consumer behavior, which has created variations in spending patterns and fluctuations in prices of various products, which may continue to change since it is not known when the pandemic will end (Borsellino et al., 2020). In times of crisis, it is necessary to consider those

healthy eating is still a trend. Suppose we link this to the need to study user retention through social media and long-term purchasing behavior. In that case, both business model and consumer behavior theories become promising areas for future research. In particular, decision journey theory and the sales funnel can be helpful to explore.

The subsections below present a discussion on each of the four topics of our model.

**Lockdown due to coronavirus impacts people’s interaction (topic 1)**

Lockdown due to COVID-19 has caused several changes in consumer behavior, which has created variations in spending patterns and fluctuations in prices of various products, which may continue to change since it is not known when the pandemic will end (Borsellino et al., 2020). In times of crisis, it is necessary to consider those
factors that serve to model consumer behavior, such as the attitude towards risk, which reflects how the consumer reacts to risk, and the perception of risk, when consumers consider how much they are exposed (Mehta et al., 2020).

The lockdown, as well as social distancing recommendations that were implemented to fight COVID-19, generated significant changes in consumer behavior. For example, the limits between professional and personal life are practically non-existent since many people work, study, and relax at home (Sheth, 2020); hence, consumers look for simple products and services that are perceived as of great value by simplifying their lives (Mehta et al., 2020).

COVID-19 has generated changes in consumers’ priorities due to the mandatory isolation adopted as a preventive action, reducing the consumption of unnecessary items and increasing the consumption of groceries and home entertainment (Mehta et al., 2020). In this context, many restaurants stopped working. Hence, consumers had to eat more at home, which increased the traffic of websites related to cooking recipes, implying a change in consumer preferences (Borsellino et al., 2020). In addition, the purchase of prepared foods decreased since they are perceived as less healthy and because people have more time to prepare their own food; on the contrary, more fresh vegetables are being bought, as they are considered healthier foods (Laguna et al., 2020). However, even though consumers bought fruit instead of beer at the beginning of the pandemic, after a while, they went back to buying beer and snacks because they were forced to stay home to prevent infections (Anastasiadou et al., 2020).

Panic buying behavior is a reaction to situations of fear and uncertainty, which generates an accumulation of basic (rational) goods or unnecessary (irrational) goods and, consequently, a shortage in the supply chain (Borsellino et al., 2020). The fear of getting sick, as well as the difficulty in accessing several products, have been the main factors that cause hoarding behavior (Hao et al., 2020). Other factors that influence the hoarding of products in times of crisis are education, income level, purchases in online stores, gender, and profession in fields related to medicine (Wang & Hao, 2020). On the one hand, hoarding is a common reaction when there is uncertainty about the future supply of products that cover basic needs. On the other hand, an informal market may arise where unauthorized intermediaries hoard essential products and generate price increases, or even counterfeit products may be sold.
(Sheth, 2020). Anastasiadou *et al.* (2020) found that consumers are more likely to accumulate a certain product if its price or maintenance cost is low or if there is a risk of receiving the product due to a crisis.

At the beginning of the pandemic, when a consumer made a purchase, he or she tried to be as fast as possible, allocating significant importance to the disinfection and cleaning of bags and shopping carts, as well as preferring to buy locally produced products, perhaps to avoid contamination by reducing their manipulation (Anastasiadou *et al.*, 2020). In this sense, the general preference for shopping, especially in Latin America and other developing regions, has shifted from traditional points of sale to more modern channels, such as supermarkets or hypermarkets, due to a perception of cleanliness and safety (Borsellino *et al.*, 2020). This is confirmed by another study that argues that those who prefer modern commerce based their decision on attributes of safety, cleanliness, and vehicle parking (Bohorquez-Lopez *et al.*, 2022).

**Increase protection to maintain operations (topic 2)**

Previous research found that fear is one of the main determinants of consumer purchasing behavior in crises (Eger *et al.*, 2021; Hassan & Soliman, 2021; Rather, 2021). These studies also indicated that people tend to comply with expectations and restrictions in risky circumstances. Roberts and David (2021) identified that fear of COVID-19 can cause increased self-efficacy as well as perceived behavioral control, with the emotional response influencing self-protective behavior (Liu *et al.*, 2021). During the COVID-19 pandemic, the perceived threat is positively correlated with the global adoption of preventive measures, resulting in elevated self-protection against the imminent threat (Itani & Hollebeek, 2021). In this context, these authors found that fear causes many people to comply with social distancing since the severity of the threat is relatively high, so social distancing is perceived as an effective coping mechanism by those who believe that they are more likely to contagion.

Czarniecka-Skubina *et al.* (2021) studied the catering industry, which has adopted new practices to minimize the risk of COVID-19 contagion, identifying the main protection measures such as hand disinfection, table disinfection, use of masks and visors by staff, the possibility of cashless payments, and maintenance of social distance. Within the protection measures that take into account a comprehensive approach to reduce the transmission of COVID-19 both inside and outside the facilities, that is, not only focusing on consumers but also on the staff working in organizations, we can highlight: vaccination of employees, ensuring that social distancing is practiced, ensuring that masks are...
used appropriately, periodically evaluating employees for COVID-19, promoting frequent hand washing, cleaning surfaces exposed to different people, and ensure adequate ventilation (Trmčić et al., 2021).

Liu et al. (2021) suggested that protective motivation theory (PMT) is often used when an individual’s self-protective behaviors arise through fear, such as the fear many people have experienced contracting COVID-19. In the context of the pandemic we are experiencing, PMT can help understand how consumers perceive threats and how their reaction, when faced with them, impacts their behavior. PMT has been used to predict behaviors related to health protection when it is subjected to several threats (Min et al., 2021), as well as to show that the perceived threat and the effectiveness of the response could contribute to fear, which is a predictor of consumer behavior during the COVID-19 pandemic (Kim et al., 2021).

Other studies have used PMT to explain that people’s fear influences their behavioral responses in such a way that they can minimize the resulting trauma, which explains why many people engage in risk-reducing behaviors through self-protection in the face of COVID-19 to reduce the possibility of infection (Liu et al., 2021). In this sense, behaviors that minimize risks (e.g., wearing masks, maintaining social distance, washing hands regularly) are present in people who fear the consequences of COVID-19 (Adunlin et al., 2021). In other words, PMT helps to understand people’s cognitive process when evaluating a threat, considering their ability to deal with it, resulting in possible protective actions. Therefore, given the current pandemic, consumers’ perceived threats and coping evaluations may influence the protective actions they take, for example, when visiting a restaurant or engaging in activities with others (Min et al., 2021).

Sustainability of consumption and current business models (topic 3)

Many consumers have been financially affected by the pandemic, so their long-term purchasing behavior has become more frugal; that is, consumers buy what they really need instead of making unnecessary purchases. Hence, one of the consequences of the pandemic has been the shift toward more responsible purchasing behavior, due not only to limited resources but also focused on sustainability (Mehta et al., 2020). In other words, consumers with sustainable consumption behavior tend to have a deeper holistic outlook and concern about moderation in consumption (Phang et al., 2021). Radcliffe et al. (2021) pointed out that the sustainability of face-to-face food systems and markets has been widely discussed and criticized in the literature, especially from the point of view of resilience. These authors highlighted the potential of bringing these spaces online to contribute to sustainability in the face of system shocks such as during the COVID-19 pandemic. Ha et al. (2021) found that consumers who were resilient during the pandemic, that is, were able to recover quickly after a crisis, were more likely to patronize small businesses, thus contributing to their survival.

The pandemic brought as a consequence a change in the priorities of consumers, generating new purchasing behaviors to cope with the uncertainty of the pandemic, demonstrating greater concern for the social and ecological, and supporting efforts to achieve sustainability and well-being of the society in this new economic environment (Sharma et al., 2021). As COVID-19 spread throughout the world, consumers faced major changes in their daily activities, including the closure of many businesses that did not know how to adapt, while those that did experience supply chain disruptions were influenced by product availability (Ha et al., 2021). In this context, people spent much more time in their homes, so they had to adopt different technologies to make purchases, and they were much more aware of the importance of saving water and energy, which has generated greater awareness of waste, as well as the adoption of some pro-environmental and social practices (Arias et al., 2021). Phang et al. (2021) stated that individuals with sustainable consumption behavior could alter their behaviors to favor mindful consumption, adopting less panic and compulsive buying relative to those who do not.

Focusing on the economic impact of the COVID-19 pandemic, most companies, regardless of their size or sector, have been forced to rethink their strategies, especially concerning their operations related to stakeholders (Vătămanescu et al., 2021). In this context, it is more important than ever for small businesses to be able to understand the behavior of their customers so that they can maintain themselves and be profitable (Arias et al., 2021). These authors identified that small companies are especially vulnerable in times of crisis due to a lack of resources compared to large companies. Therefore, small businesses must analyze how, when, where, and to whom they sell their products to achieve long-awaited sustainability during and after the crisis (Ha et al., 2021). In this sense, small businesses could benefit from a better understanding of their consumers, such as knowing their emotions related to the pandemic (resilience, optimism, etc.) and their profile (generational category, employment situation, income, etc.). By segmenting their customers, they will have more and better tools to give them what they need with limited resources (Ha et al., 2021).
COVID-19 has significantly impacted small businesses, many of which remain at risk of disrupting operations. However, now more than ever, it is vital to understand the factors that contribute to the survival of small businesses in the face of a crisis, such as the frequency of purchase by their consumers and the number of services used and preferred, which can serve to achieve their survival during this difficult time (Ha et al., 2021). Vatamanescu et al. (2021) empirically validated the importance of product sustainability attributes, highlighting that social and environmental sustainability practices are necessary for good business performance, especially during the pandemic. In addition, small businesses must build trust with their consumers to foster long-term, mutually beneficial relationships; they can achieve this by posting relevant information on their social networks to generate a feeling of identification among their followers (Ha et al., 2021). In that sense, online communities can be considered helpful for building a community around shared ethics and beliefs that can support the greater use of sustainable consumption practices (Radcliffe et al., 2021).

The pandemic moves online consumption (topic 4)

Pham et al. (2020) analyzed the role of COVID-19 as a moderating variable between the consumer’s perception of interest and their online shopping activities, finding that this situation encourages consumers to make purchases using digital channels, significantly reducing the number of purchases and visits to physical stores due to fear of contagion. Instead, they shopped online much more than before due in part to restrictions on movement, which may hold when things return to normal due to convenience (Borsellino et al., 2020). These authors identified that the increase in online purchases had affected food deliveries since, in some cases, they were not only delayed but not even shipped. On the consumer side, it is increasingly necessary for them to have information to control, prevent, or respond to fear and perceived risks, which generates a high level of interactivity and social presence in electronic commerce platforms (Addo et al., 2020). This will enable them to adopt new attitudes, such as shopping on different websites, changing stores when shopping, eating at nearby restaurants and using store pickup (Anastasiadou et al., 2020).

The COVID-19 pandemic has accelerated digital transformation, with digital channels becoming more important than ever. In contrast, the lockdown has made companies aware of the importance of digitalization throughout the value chain to improve not only resilience and efficiency but also demand forecasting (Vatamanescu et al., 2021). The need to face the pandemic crisis has forced small companies and intermediaries to embrace vertical integration and omnichannel strategies (Gutiérrez-Leefmans, 2022). This crisis period has prompted a change in consumer behavior that has migrated from physical stores to online purchases, which is likely to continue in the future, increasing the frequency of online purchases and changing their consumption habits (Yin et al., 2021). Along the same lines, Mehta et al. (2020) indicated that these changes in behavior result in a change in the spending pattern, as well as the use of various electronic contact points to buy, such as the official product site, social networks, mobile platforms, etc. This impacted the reduction of traditional outdoor advertising and decreased visits to shopping centers due to social distancing. The challenge for companies now is developing an effective omnichannel strategy where the marketing mix is consistent across channels.

Yin et al. (2021) argued that previous studies found that changes in consumer behavior due to COVID-19 have created many opportunities for industry reform, which should be used to integrate offline processes with online processes since, in this way, economic development will be promoted (Yin et al., 2021). Akram et al. (2021) point out that online consumption and digitization in a crisis context not only impact customers’ well-being but also imply great challenges and development opportunities for the retail industry. Therefore, the evolution of online markets can make it possible for customers to connect with local suppliers, fostering the creation of a community around ethical and responsible consumption. In this sense, online markets can help efficiently connect customers and suppliers to reduce physical contact and interactions in public spaces, potentially fostering a real community based on caring, shared interest, and consumption ethics (Radcliffe et al., 2021).

In the new normal, digital technologies play a fundamental role in maintaining retail operations and in the possibility of offering quality and uninterrupted customer service; these technologies help retailers improve their crisis management capabilities, which benefits the entire value chain (Jiang & Stylos, 2021). It is important to remark that those companies with capabilities based on digital technologies can optimize their businesses with much more flexibility in response to changes that arise in the external environment (Wang et al., 2020). This avoids crowding in their premises and the consequent spread of contagion by offering free store pick-up or home delivery to clients (Borsellino et al., 2020), and strategically improves their online presence and attracting consumers with offers specific to their profile, thus mitigating the decrease in sales (Koch et al., 2020).
Conclusions

There has been an evolution in the topics investigated between 2020 and 2021: the lockdown due to the impact of the coronavirus (topic 1) on interaction as a natural topic of study in the first year of the pandemic; while in the second year, it was essential to know more about the necessary protection to be able to maintain business operations (topic 2), as well as the change in consumer behavior and organizations towards sustainability (topic 3), which was reflected in the evaluation of current business models. However, topic 4 stands out as a stream of literature that continues to evolve and will most likely continue to do so. As we approach the third year (2022) of the pandemic and many activities begin to normalize, it will be interesting to analyze the development of research trends in the near future. For example, topics 2 (security) and 3 (sustainability) will remain relevant to academics. The four topics were organized in a theoretical model (figure 4), which is the main contribution of our research.

The generalized lockdown generated changes in the behavior of consumers, who, unable to go out for shopping or work, have had to carry out their daily activities from home. External and internal drivers, which traditionally affect consumer behavior (personality type, brand image, status, etc.), have become obsolete in the pandemic context, with other drivers emerging, such as recycling and the reuse of products that need to be studied in depth. This situation has made the attributes of comfort and personalization much more valued by consumers. However, there are few studies on how this trend of staying at home for so long has affected planned versus unplanned consumption. Hence, some old habits may disappear because, in this new context, the consumer has discovered more convenient, affordable, and accessible consumption alternatives. However, future research is needed to analyze which behaviors will return and which will remain post-pandemic.

In crises, small businesses should convey positive emotions to consumers through context-specific marketing messages, which could be shared through their social networks. Studies can be conducted to assess whether these types of marketing actions, not only personalized but also with messages specific to the context of the pandemic, help increase loyalty and therefore increase the average customer purchase ticket. In addition, it could be interesting to know the role of social media during the pandemic or which sectors benefited or suffered from its effects. Other studies can look at how consumers assess perceived risks and their severity during the pandemic to determine different levels of protection, as well as different levels of coping, which will influence the adoption of responsible and recommended behaviors. Therefore, it is essential to deepen this topic in further studies to help small businesses adapt to these new requirements and governments so that they can define public policies that help promote responsible behavior. As a result, security and sustainability issues related to the pandemic have become relevant.

Methodologically, surveys appeared among the most prominent words, which stresses the high use of this methodology by researchers in both years. This is confirmed by looking at the most cited research on consumer behavior and COVID-19. Consequently, we encourage using qualitative analysis and other methodologies to contribute to the marketing trends and consumer behavior literature. Technology facilitates online research methods and should be further exploited. A topic that did not appear among the most cited in the database used and could be exploited for future research was education. Besides the shift to the online mode, scholars can inquire about how the behavior of students and teachers changed concerning education as a result of COVID-19 and how educational marketing strategies should also change. Finally, the main limitation of this study is related to using only the Scopus database; hence, other studies could extend this work to other databases.

Research agenda

We propose the following research agenda derived from our analysis and confirming previous studies in the literature. In contrast to previous studies, we find that future research areas go beyond technology and information search (Cruz-Cárdenas et al., 2021) or social and cause-related marketing (Maulana, 2020). It is important to highlight a particular emphasis needed in studies related to small companies’ business models and digital transformation. Various core marketing areas need researchers’ attention in the context of COVID-19, such as:

- Social media advertising and communication.
- Regulations and policies for SMEs in the new normal.
- Issues and challenges for educational marketers.
- Local purchase preference and ethical consumption.
- Omni-channel marketing strategy and distribution.
- Porter’s value chain and customer service.
- Consumer value shifts and new business models.
- Green business models and responsible behavior.
- Cashless payments and digital transformation.
- Protective behavior and e-commerce deliveries.
Two important future research areas related to consumer behavior are the study of augmented reality (AR) and neuromarketing, where few studies can be found. Relating the pandemic's effects on consumers' emotions and desires to an immersive reality where users can feel safe and have a unique experience can certainly bring interesting insights.

Among our findings' practical and managerial implications are the focus needed on marketing for local consumption. In omnichannel strategies, a special emphasis is needed on customer service, which literature related to COVID-19 has also highlighted. Not only is digitalization required but understanding customer value shifts seems to be vital for successful business models. Also, innovative ways to enhance the digital experience should be explored, such as AR, where technology will play a vital role for companies.

Regarding policy implications, security and consumer protection are still issues businesses face. Hence, the need for proper regulations that help them continue operations, ensuring consumer safety. Other issues concerning government regulations are the need for sustainable business models and digital transformation. In some countries, SMEs receive financial help from governments to survive and invest. However, that is not a common trend in developing countries, where SMEs represent an important part of employment.

Disclosures
Authors declare no institutional or personal conflicts of interest.

References
Addo, P. C., Jiaming, F., Kulibo, N. B., & Liangqiang, L. (2020). Coronavirus: Fear appeal favoring purchase behavior towards personal protective equipment. The Service Industries Journal, 40(7-8), 417-490. https://doi.org/10.1080/02642069.2020.1751823
Adunlin, G., Adedoyin, A. C. A., Adedoyin, O. O., Njoku, A., Bolade-Ogunfodun, Y., & Bolaji, B. (2021). Using the protection motivation theory to examine the effects of fear arousal on the practice of social distancing during the COVID-19 outbreak in rural areas. Journal of Human Behavior in the Social Environment, 127(1-4), 168-172. https://doi.org/10.1080/10911359.2020.1783419
Akrum, U., Fülöp, M. T., Tiron-Tudor, A., Topor, D. I., & Cárpata, E. (2021). Impact of digitalization on customers' well-being in the pandemic period: Challenges and opportunities for the retail industry. International Journal of Environmental Research and Public Health, 18(14), 7533. https://doi.org/10.3390/ijerph18147533
Allingent, D., Duffy, B., Wessely, S., Dhavan, N., & Rubin, J. (2021). Health-protective behaviour, social media usage and conspiracy belief during the COVID-19 public health emergency. Psychological Medicine, 51(10), 1763-1769. https://doi.org/10.1017/S003329172000224X
Amado, A., Cortez, P., Rita, P., & Moro, S. (2018). Research trends on big data in marketing: A text mining and topic modeling based literature analysis. European Research on Management and Business Economics, 24(1), 1-7. https://doi.org/10.1016/j.eire.2017.06.002
Anastasiadou, E., Chriossos Anestis, M., Karantz, I., & Vlachakis, S. (2020). The coronavirus' effects on consumer behavior and supermarket activities: Insights from Greece and Sweden. International Journal of Sociology and Social Policy, 40(9/10), 893-907. https://doi.org/10.1108/ijssp-07-2020-0275
Arias, C., Vélez-Rolón, A. M., & Méndez-Pinzón, M. (2021). Mapping the concept of sustainable consumption: An analysis from the adoption and promotion of pro-environmental and social behaviors in university students. Frontiers in Education, 6, 729939. https://doi.org/10.3389/feduc.2021.729939
Asmussen, C. B., & Møller, C. (2019). Smart literature review: A practical topic modelling approach to exploratory literature review. Journal of Big Data, 6, 93. http://doi.org/10.1186/s40537-019-0255-7
Ben Hassen, T., El Bilali, H., & Allayahri, M. S. (2020). Impact of COVID-19 on food behavior and consumption in Qatar. Sustainability, 12(17), 6973. https://doi.org/10.3390/su12176973
Bento, A. I., Nguyen, T., Wing, C., Lozano-Rojas, F., Ahn, Y. Y., & Simon, K. (2020). Evidence from internet search data shows information-seeking responses to news of local COVID-19 cases. Proceedings of the National Academy of Sciences, 117(21), 11220-11222. https://doi.org/10.1073/pnas.2005335117
Blei, D. M. (2012). Probabilistic topic models. Communications of the ACM, 55(4), 77-84. https://doi.org/10.1145/2133806.2133826
Bohorquez-Lopez, V. W., García-Ortíz, P. A., Méndez-Lazarte, C., & Caycho-Chumpitaz, C. (2022). Atributos diferenciadores entre el comercio minorista tradicional y el moderno. Innovar, 32(83), 75-86. https://doi.org/10.15446/innovar.v32n83.99890
Borsellino, V., Kali, S. A., & Schimmenti, E. (2020). COVID-19 drives consumer behaviour and agro-food markets towards healthier and more sustainable patterns. Sustainability, 12(20), 8366. https://doi.org/10.3390/su12208366
Cruz-Cárdenas, J., Zabelina, E., Guadalupe-Lanas, J., Palacio-Fierro, A., & Ramos-Galarza, C. (2021). COVID-19, consumer behavior, technology, and society: A literature review and bibliometric analysis. Technological Forecasting and Social Change, 173, 121179. https://doi.org/10.1016/j.techfore.2021.121179
Czarniecka-Skubina, E., Pielak, M., Salek, P., Gluchowski, A., Kubiś-Cisowska, J., & Owczarek, T. (2021). Use of food services by consumers in the SARS-CoV-2 Pandemic. How the eating habits of consumers changed in view of the new disease risk factors? Nutrients, 13(8), 2760. https://doi.org/10.3390/nu13082760
Debortoli, S., Müller, O., Junglas, I., & vom Brocke, J. (2016). Text mining and analysis of social media data. Communications of the Association for Information Systems, 39, 110-135. http://doi.org/10.17705/1CAIS.03907
Di Crosta, A., Ceccato, I., Marchetti, D., La Malva, P., Maiella, R., Canito, L., Cipí, M., Mammarella, N., Palumbo, R., Verrocchio, M. C., Palumbo, R., & Di Domenico, A. (2021). Psychological factors and consumer behavior during the COVID-19 pandemic. PLOS ONE, 16(8). https://doi.org/10.1371/journal.pone.0256095
Donthu, N., & Gustafsson, A. (2020). Effects of COVID-19 on business and research. Journal of Business Research, 117, 284-289. https://doi.org/10.1016/j.jbusres.2020.06.008
Eger, L., Komárová, L., Egerová, D., & Mičič, M. (2021). The effect of COVID-19 on consumer shopping behaviour: Generational cohort perspective. Journal of Retailing and Consumer Services, 61, 102542. https://doi.org/10.1016/j.jretconserv.2021.102542
Gu, S., Siusarzyczyk, B., Hajizada, S., Kovalyova, I., & Sakhkhieva, A. (2021). Impact of the COVID-19 pandemic on online consumer purchasing.
behavior. *Journal of Theoretical and Applied Electronic Commerce Research*, 16(6), 2263-2281. https://doi.org/10.3390/jtare16060125

Gutiérrez-Leefoom, M. (2022). Channel structure innovation as a response to COVID-19 pandemic. Cases from Mexico. In R. K. Kovid & V. Kumar (Eds.), *Cases on Emerging Markets Responses to the COVID-19 Pandemic* (pp. 1-20). IGI Global Publishing. https://doi.org/10.4018/978-1-7689-3504-5

Ha, S., Childs, M., Sneed, C. T., & Berry, A. (2021). Consumer sustainable shopping practices for small business during COVID-19. *Sustainability*, 13(22), 12451. https://doi.org/10.3390/su132212451

Hall, M. C., Prayag, G., Fieger, P., & Dyason, D. (2021). Beyond panic buying: consumption displacement and COVID-19. *Journal of Service Management*, 32(1), 113-128. https://doi.org/10.1108/JOSM-05-2020-0151

Hannigan, T., Haans, R. F. J., Vakili, K., Tchalian, H., Glaser, V., Wang, M., Kaplan, S., & Jennings, P. D. (2019). Topic modeling in management research: Rendering new theory from textual data. *Academy of Management Annals*, 13(2), 586-632. http://doi.org/10.5465/annals.2017.0099

Hao, N., Wang, H. H., & Zhou, Q. (2020). The impact of online grocery shopping on stockpile behavior in COVID-19. *China Agricultural Economic Review*, 12(3), 459-470. https://doi.org/10.1108/CAER-04-2020-0064

Hassan, S. B., & Soliman, M. (2021). COVID-19 and repeat visitation: Assessing the role of destination social responsibility, destination reputation, holidaymakers’ trust and fear arousal. *Journal of Destination Marketing & Management*, 19, 100495. https://doi.org/10.1016/j.jdmm.2020.100495

Hobbs, J. E. (2020). Food supply chains during the COVID-19 pandemic. *Canadian Journal of Agricultural Economics*, 68(2), 171-176. https://doi.org/10.1111/cjage.12237

Hoekstra, J. C., & Leeflang, P. S. (2020). Marketing in the era of COVID-19. *Italian Journal of Marketing*, 2020(4), 249-260. https://doi.org/10.1007/s43039-020-00016-3

Hu, N., Zhang, T., Gao, B., & Bose, I. (2019). What do hotel customers complain about? Text analysis using structural topic model. *Tourism Management*, 72, 417-426. https://doi.org/10.1016/j.tourman.2019.01.002

Islam, T., Pitafi, A. H., Arya, V., Wang, Y., Akhtar, N., Mukarik, S., & Xiaohei, L. (2021). Panic buying in the COVID-19 pandemic: A multi-country examination. *Journal of Retailing and Consumer Services*, 59, 102357. https://doi.org/10.1016/j.jretconserv.2020.102357

Itani, O. S., & Hollebeek, L. D. (2021). Light at the end of the tunnel: Visitors’ virtual reality (versus in-person) attraction site tour-related behavioral intentions during and post-COVID-19. *Tourism Management*, 84, 104290. https://doi.org/10.1016/j.tourman.2021.104290

Jacobi, C., van Atteveldt, W., & Welbers, K. (2015). Quantitative analysis of large amounts of journalistic texts using topic modelling. *Digital Journalism*, 4(1), 89-106. http://doi.org/10.1080/21670811.2015.1093271

Jiang, Y., & Stylos, N. (2021). Triggers of consumers’ enhanced digital engagement and the role of digital technologies in transforming the retail ecosystem during COVID-19 pandemic. *Technological Forecasting & Social Change*, 172, 121029. https://doi.org/10.1016/j.techfore.2021.121029

Jilková, P., & Králová, P. (2021). Digital consumer behaviour and e-commerce trends during the COVID-19 crisis. *International Advances in Economic Research*, 27(1), 83-85. https://doi.org/10.1007/s11294-021-09817-4

Jribi, S., Ismail, H. B., Doggui, D., & Debbabi, H. (2020). COVID-19 virus outbreak lockdown: What impacts on household food wastage? *Environment, Development and Sustainability*, 22(5), 3939-3955. https://doi.org/10.1007/s10668-020-00740-y

Kim, J., Yang, K., Min, J., & White, B. (2021). Hope, fear, and consumer behavioral change amid COVID-19: Application of protection motivation theory. *International Journal of Consumer Studies*, 46(2), 558-574. https://doi.org/10.1111/ics.12700

Kirk, C. P., & Rifkin, L. S. (2020). I’ll trade you diamonds for toilet paper: Consumer reacting, coping and adapting behaviors in the COVID-19 pandemic. *Journal of Business Research*, 117, 124-131. https://doi.org/10.1016/j.jbusres.2020.05.028

Koch, J., Frommeyer, B., & Schewe, G. (2020). Online shopping motives during the COVID-19 pandemic—Lessons from the crisis. *Sustainability*, 12(24), 10247. https://doi.org/10.3390/su122410247

Laguna, L., Fisman, S., Puerta, P., Chaya, C., & Tárrega, A. (2020). The impact of COVID-19 lockdown on food priorities. Results from a preliminary study using social media and an online survey with Spanish consumers. *Food Quality and Preference*, 86, 104028. https://doi.org/10.1016/j.foodqual.2020.104028

Laato, S., Islam, A. N., Farooq, A., & Dhir, A. (2020). Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach. *Journal of Retailing and Consumer Services*, 57, 102224. https://doi.org/10.1016/j.jretconserv.2020.102224

Liu, C., Sun, C. K., Chang, Y. C., Yang, S. Y., Liu, T., & Yang, C. C. (2021). The impact of the fear of COVID-19 on purchase behavior of dietary supplements: Integration of the theory of planned behavior and the protection motivation theory. *Sustainability*, 13(22), 12900. https://doi.org/10.3390/su132212900

Maulana, N. (2020). Research trends in marketing science before Covid-19 outbreak: A literature review. *Management & Marketing*, 15, 514-533. https://doi.org/10.2478/mmcks-2020-0030

Mehta, S., Saxena, T., & Purohit, N. (2020). The new consumer behaviour paradigm amid COVID-19: Permanent or transient? *Journal of Health Management*, 22(2), 291-301. https://doi.org/10.1177/0972063420940834

Min, J., Kim, J., & Yang, K. (2021). How generations differ in coping with a pandemic: The case of restaurant industry. *Journal of Hospitality and Tourism Management*, 48, 280-288. https://doi.org/10.1016/j.jhtmt.2021.06.017

Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: A comparative analysis. *Scientometrics*, 106(1), 213-228. https://doi.org/10.1007/s11192-015-1765-5

Motta, G., Gentile, E., Parisi, A., & Spasiano, D. (2020). A preliminary evaluation of the public risk perception related to the COVID-19 health emergency in Italy. *International Journal of Environmental Research and Public Health*, 17(9), 3024. https://doi.org/10.3390/ijerph17093024

Nicolas, C., Valenzuela-Fernández, L., & Merigó, J. M. (2020). Research trends of marketing: A bibliometric study 1990-2017. *Journal of Promotion Management*, 26(3), 674-703. https://doi.org/10.1080/10496491.2020.1729315

Paakkari, L., & Okan, O. (2020). COVID-19: Health literacy is an underestimated problem. *The Lancet. Public Health*, 5(5), e249-e250. https://doi.org/10.1016/S2468-2667(20)30086-4

Pantano, E., Pizzi, G., Scarpi, D., & Dennis, C. (2020). Competing during a pandemic? Retailers’ ups and downs during the COVID-19 outbreak. *Journal of Business Research*, 116, 209-213. https://doi.org/10.1016/j.jbusres.2020.05.036

Pham, V. K., Do Thi, T. H., & Ha Le, T. H. (2020). A study on the COVID-19 awareness affecting the consumer perceived benefits of online
shopping in Vietnam. *Cogent Business & Management*, 7(1). https://doi.org/10.1080/23311975.2020.1846882

Phang, I. G., Balakrishnan, B. K. P. D., & Ting, H. (2021). Does sustainable consumption matter? Consumer grocery shopping behaviour and the pandemic. *Journal of Social Marketing*, 11(4), 507-522. https://doi.org/10.1108/JOSCM-12-2020-0245

Radcliffe, J., Skinner, K., Spring, A., Picard, L., Benoit, F., & Dodd, W. (2021). Virtual barriers: Unpacking the sustainability implications of online food spaces and the Yellowknife Farmers Market’s response to COVID-19. *Nutrition Journal*, 20(1). https://doi.org/10.1186/s12937-021-00664-x

Rather, R. A. (2021). Demystifying the effects of perceived risk and fear on customer engagement, co-creation and revisit intention during COVID-19: A protection motivation theory approach. *Journal of Destination Marketing & Management*, 20, 100564. https://doi.org/10.1016/j.jdmm.2021.100564

Roberts, J. A., & David, M. E. (2021). Improving predictions of COVID-19 preventive behavior: Development of a sequential mediation model. *Journal of Medical Internet Research*, 23(3), e23218. https://doi.org/10.2196/23218

Rossetti, M., Stella, F., & Zanker, M. (2016). Analyzing user reviews in tourism with topic models. *Information Technology & Tourism*, 16(1), 5-21. https://doi.org/10.1007/s40558-015-0035-y

Sarkis, J. (2021). Supply chain sustainability: Learning from the COVID-19 pandemic. *International Journal of Operations & Production Management*, 41(1), 63-73. https://doi.org/10.1108/IJOPM-08-2020-0568

Satish, K., Venkatesh, A., & Manivannan, A. S. R. (2021). Covid-19 is driving fear and greed in consumer behaviour and purchase pattern. *South Asian Journal of Marketing*, 2(2), 113-129. https://doi.org/10.1108/SAJM-03-2021-0028

Schmiedel, T., Müller, O., & vom Brocke, J. (2019). Topic modeling as a strategy of inquiry in organizational research: A tutorial with an application example on organizational culture. *Organizational Research Methods*, 22(4), 941-968. https://doi.org/10.1177/1094428118773858

Sharma, G. D., Thomas, A., & Paul, J. (2021). Reviving tourism industry post-COVID-19: A resilience-based framework. *Tourism Management Perspectives*, 37, 100786. https://doi.org/10.1016/j.tmp.2020.100786

Sheth, J. (2020). Impact of Covid-19 on consumer behavior: Will the old habits return or die? *Journal of Business Research*, 117, 280-283. https://doi.org/10.1016/j.jbusres.2020.05.059

Shin, H., & Kang, J. (2020). Reducing perceived health risk to attract hotel customers in the COVID-19 pandemic era: Focused on technology innovation for social distancing and cleanliness. *International Journal of Hospitality Management*, 91, 102664. https://doi.org/10.1016/j.ijhm.2020.102664

Sidor, A., & Rzymski, P. (2020). Dietary choices and habits during COVID-19 lockdown: Experience from Poland. *Nutrients*, 12(6), 1657. https://doi.org/10.3390/nu12061657

Silva, C. C., Galster, M., & Gilson, F. (2021). Topic modeling in software engineering research. *Empirical Software Engineering*, 26(6), 120. https://doi.org/10.1007/s10664-021-10026-0

Sun, L., & Yin, Y. (2017). Discovering themes and trends in transportation research using topic modeling. *Transportation Research Part C: Emerging Technologies*, 77, 49-66. https://doi.org/10.1016/j.trc.2017.01.013

Trmčić, A., Demnings, E., Kniel, K., Wiedmann, M., & Alcaine, S. (2021). Food safety and employee health implications of COVID-19: A review. *Journal of Food Protection*, 84(11), 1973-1989. https://doi.org/10.4315/JFP-21-201

Upreti, B., Asatiani, A., & Malo, P. (2016, January). To reach the clouds: Application of topic models to the meta-review on cloud computing literature [Conference session]. 49th Hawaii International Conference on System Sciences (HICSS), Koloa, HI, United States. https://doi.org/10.1109/HICSS.2016.493

Vanapalli, K. R., Sharma, H. B., Ranjan, V. P., Samal, B., Bhattacharya, J., Dubey, B. K., & Goel, S. (2021). Challenges and strategies for effective plastic waste management during and post COVID-19 pandemic. *Science of the Total Environment*, 750, 141514. https://doi.org/10.1016/j.scitotenv.2020.141514

Vătămănescu, E. M., Dabija, D. C., Gazzola, P., Cegarro-Navarro, J. G., & Buzzi, T. (2021). Before and after the outbreak of Covid-19: Linking fashion companies’ corporate social responsibility approach to consumers’ demand for sustainable products. *Journal of Cleaner Production*, 32f1, 128945. https://doi.org/10.1016/j.jclepro.2021.128945

Walker, R. M., Chandra, Y., Zhang, J., & Witteleostuijn, A. (2019). Topic modeling the research-practice gap in public administration. *Public Administration Review*, 79(6), 931-937. https://doi.org/10.1111/puar.13095

Wang, H. H., & Hao, N. (2020). Panic buying? Food hoarding during the pandemic period with city lockdown. *Journal of Integrative Agriculture*, 19(12), 2916-2925. https://doi.org/10.1016/s2095-3119(20)63448-7

Wang, Y., Hong, A., Li, X., & Gao, J. (2020). Marketing innovations during a global crisis: A study of China firms’ response to COVID-19. *Journal of Business Research*, 116, 214-220. https://doi.org/10.1016/j.jbusres.2020.05.029

Yin, B., Yu, Y., & Xu, X. (2021). Recent advances in consumer behavior theory: Shocks from the COVID-19 pandemic. *Behavioral Sciences*, 11(2), 171. https://doi.org/10.3390/bs11120171

Yuen, K. F., Wang, X., Ma, F., & Li, K. X. (2020). The psychological causes of panic buying following a health crisis. *International Journal of Environmental Research and Public Health*, 17(10), 3513. https://doi.org/10.3390/ijerph17103513

Zwanka, R. J., & Buff, C. (2021). COVID-19 generation: A conceptual framework of the consumer behavioral shifts to be caused by the COVID-19 pandemic. *Journal of International Consumer Marketing*, 33(1), 58-67. https://doi.org/10.1080/08961530.2020.1771646
