

## Online food delivery companies' performance and consumers expectations during Covid-19: An investigation using machine learning approach

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### ARTICLE INFO

#### Keywords:

Online food delivery  
Performance  
COVID-19  
Social responsibility  
Consumer sentiment  
Topic modeling

### ABSTRACT

Online food delivery (OFD) businesses flourished during COVID-19; however, OFD companies experienced different challenges and customers' expectations. This paper uses social media data to explore OFD companies' performance and customers' expectations during the COVID-19 pandemic. The most important topics in developed and developing countries are identified using machine learning. Results show that customers in India are more concerned about social responsibility, while financial aspects are more important in the US. Overall, customers in India are more satisfied with OFD companies during the COVID-19 pandemic than the US customers. We further find that factors such as OFD companies' brand, market size, country, and COVID-19 waves play a crucial role in moderating customer sentiment. The results of the study offer several managerial insights.

### 1. Introduction

The COVID-19 pandemic has caused a profound and severe impact on the global economy. As the COVID-19 pandemic started, many restaurants worldwide lost billions of dollars, and many even faced business closures (National Restaurant Association, 2020). According to the National Restaurant Association (2020) report, the restaurant industry has already lost approximately \$240 billion by 2020. Restaurants that remained in business found it essential to adapt to recent changes in the industry and offer online food delivery (OFD) services for their survival (Brewer and Sebby, 2021). Many restaurants started using third-party food delivery providers' services during the pandemic. It resulted in a significant increase in online OFD businesses worldwide. For example, Uber Eats observed a substantial increase in OFD orders following the mandate of no dine-in service (Raj et al., 2021).

The platform economy in the food sector is not more prominent in terms of labor participation in India (Sundararajan, 2016; Pant and Shende, 2020). However, with entries of global OFD leading companies such as Uber Eats along with some Indian companies—Zomato and Swiggy—the OFD industry is proliferating with a 25–30 percent annually (Boston Consulting Group, 2020). The overall platform economy in India is expected to be \$30 billion by 2025 (NASSCOM, 2018). In 2019, more than 48 million people used OFD platforms in the US, which is likely to be approximately 70 million in 2024. The OFD revenue in the

US is expected to grow steadily at 7.26 percent annually and is estimated to be \$41,504 million by 2025 (Statista, 2021). As per the 2022 Statista report, the global OFD service market is expected to reach \$223.7 billion in 2025 from \$115.07 billion in 2020 (Statista, 2022).

In recent years, the number of laborers who work in the platform economy has increased significantly. According to the NITI Aayog (a policy think tank of the India government), the platform economy employs around 15 million workers, and approximately 0.44 million of them work in the food sector (Tiwari et al., 2019). Food delivery workers are not hired as full-time employees like any other sharing economy sector. These workers are primarily considered interchangeable or "gig workers" by food delivery companies (Sundararajan, 2016).

During the first wave of COVID-19, most restaurants in the US were forced to suspend dine-in services and were only allowed to operate via takeout, drive-through, or contactless deliveries. As the COVID-19 outbreak started, restaurants demand started plumbing globally and affected the financial performance of the restaurant industry. In US restaurants, customer demand decreased drastically with increasing COVID-19 cases (Yang et al., 2020). However, more and more people started ordering foods online via food delivery platforms like DoorDash, Grubhub, Uber Eats (in the US), Zomato, and Swiggy (in India) (Jain, 2020; Kim et al., 2021). Restaurants that provided OFD and curbside pickup services for contactless delivery experienced a lesser effect on financial performance. Most of these OFD services businesses were in

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operation during the COVID-19 outbreak as they are considered among the essential services. The OFD service platforms were instrumental for restaurants to remain in business during challenging times (Puram et al., 2021). Compared to March 2019, customer spending on food delivery increased significantly (i.e., 70 percent)—during the first COVID-19 wave in March 2020 (Chen McCain et al., 2021).

On the flip side, OFD service providers (i.e., riders or drivers) and consumers faced several challenges during the ongoing pandemic. For example, Indian OFD workers have faced personal and social risks, ranging from loss of income to exposure to COVID-19 and risking their lives (Lalvani and Seetharaman, 2020). The OFD became crucial and popular as millions of people were quarantined and unquarantined required foods (Chen McCain et al., 2021; Kim et al., 2021). While delivering food, OFD companies needed to follow strict COVID-19 appropriate behaviors; otherwise, riders and consumers would be exposed to life-threatening health risks.

Overall, during the COVID-19 pandemic, consumers prioritized expectations from OFD companies, and the challenges faced by OFD companies were different from those of the pre-COVID-19 pandemic (Gavilan et al., 2021). The adaptability of food delivery companies to a situation of a global healthcare crisis, where customers' expectations are entirely different (Gavilan et al., 2021; Nguyen and Vu, 2020). It may depend on several factors, such as fear (Balakrishnan, 2020; Mehrolia et al., 2021; Ahorsu et al., 2020; Lo Coco et al., 2021), marketing strategies during COVID-19 waves (Jia et al., 2021), brand perception (Dsouza and Sharma, 2021; Prasetyo et al., 2021), market size, region (developing or developed countries) of their operations (Keeble et al., 2020; Zanetta et al., 2021), public listing (Bao and Zhu, 2022), and COVID-19 waves (Kohút et al., 2021; Mohan et al., 2022), etc. For example, OFD companies with better brand perception, bigger market size, and listed in the stock market should do better in a crisis. They may also improve their performance in the second wave better than in the first wave of the COVID-19 pandemic. Therefore, to have a deeper understanding of the delivery operations of OFD companies and consumers' behaviors/expectations during a global healthcare crisis, it is crucial to understand how OFD companies performed, to what extent consumers' expectations were met, and factors that can explain OFD companies' performance or customers' satisfaction during COVID-19 pandemic.

Most of the erstwhile work in the literature on OFD is conducted predominantly using primary data with a limited sample size. To the best of our knowledge, no study exists in the literature that considers social media-based big data relating to OFD companies during the pandemic and uses qualitative (machine learning algorithms) as well as quantitative approaches to investigate issues faced by OFD companies, service providers, and customers during the first two waves of the COVID-19 in the US and Indian market. Specifically, this study investigates how do consumers' sentiments vary on OFD companies' services during COVID-19 across different dimensions of consumer expectations, market characteristics, and companies' characteristics?

The following research objectives (RO) are considered to address the research question:

**RO1:** To identify the broader issues/topics prominently discussed about OFD companies and service providers during the pandemic.

**RO2:** To investigate consumers' net sentiment and negative sentiment across identified dimensions, OFD companies, and different countries.

**RO3:** To test the impact of different market characteristics and OFD companies' characteristics on consumers' sentiments.

To address these research objectives, first, we collected data for four OFD companies (i.e., Uber Eats, Grubhub, Zomato, and Swiggy) from Twitter during the first two waves of the COVID-19 pandemic. Second, the text mining approach is used to identify different topics/issues discussed on Twitter about these OFD companies. Third, for each identified topic, positive and negative sentiments of people are computed. Fourth, different regression models are developed to investigate the relationship

between the moderating variables and people's sentiments. Finally, the results of both countries' companies are compared to examine the differences among the topics and customers' sentiments. The results offer several important practical insights which are helpful for OFD companies.

The remainder of the paper is organized as follows. Section 2 discusses the analyses of relevant literature. Section 3 presents the research hypotheses. Data collection, research methodology, and results are provided in Section 4. Section 5 presents discussion and managerial insights. Finally, section 6 concludes the research and offers the scope for future studies.

## 2. Literature review

There was not much research conducted on the OFD area before the COVID-19 pandemic. Previous studies have mainly focused on issues such as the OFD platform's performance and customer satisfaction (Seghezzi and Mangiaracina, 2020; Gilitwala and Nag, 2019), consumers behavior and attitude (Pigatto et al., 2017; Hwang and Choe, 2019; Yeo et al., 2021), vehicle routing problems (Liu et al., 2020; Correa et al., 2019), adoption and acceptance of technology in OFD apps (Pigatto et al., 2017; Gundén et al., 2020; Roh and Park, 2019), and riders issues related to wages and health (Bates et al., 2020; Correa et al., 2019; Kougiannou and Mendonça, 2021). For a detailed discussion on these issues, interested readers can refer to Li et al. (2020) and Seghezzi et al. (2021), who have provided an excellent review of OFD literature published before the COVID-19 period.

Research on the OFD has witnessed significant growth during the last two years. One of the reasons for this rapid growth was the rapid increase in OFD services demand during the COVID-19 pandemic. For safety reasons, more people started ordering their food from home via OFD apps (Mehrolia et al., 2021; Zanetta et al., 2021; Hong et al., 2021), such as Uber Eats, DoorDash, Zomato, and Swiggy. Several researchers (Hong et al., 2021; Gani et al., 2021) have studied how these new behaviors of people affect the food delivery business during the COVID-19 outbreak.

As per the world health organization (WHO), more than 6.28 million people have already died because of the COVID-19 pandemic. It has affected people's life emotionally, psychologically, and physically (Ahorsu et al., 2020; Conte et al., 2021; Watson and Popescu, 2021). People have used several ways to deal with the stress, anxiety, and loneliness caused by the COVID-19 (Kumar and Shah, 2020; Ahorsu et al., 2020; Lo Coco et al., 2021). Consumers have extensively utilized different social media platforms to share their opinion and remain updated with the public policies and regulations during the COVID-19 (Rydell and Kucera, 2021; Trivedi and Singh, 2021). Several researchers studied how the COVID-19 has changed consumers' behavior, habits, and tastes when buying food online (Watson and Popescu, 2021; Birtus and Lăzăroiu, 2021; Rydell and Suler, 2021; Smith and Machova, 2021). Michalikova et al. (2022) have reviewed the literature on customers' judgment, behavior intentions, and purchase decision dynamics during the COVID-19 pandemic in the food delivery sector.

COVID-19 has considerably impacted the financial strength of restaurant firms; however, restaurant firms that used OFD and other contactless delivery services experienced relatively lesser financial glitches (Kim et al., 2021). Before COVID-19, the primary marketing strategies were based on product imagery, links, and sponsorships. While combatting the COVID-19 pandemic, selling social distancing, appropriating frontline workers, and accelerating digitalization were the selling points (Jia et al., 2021). We classify the research conducted on OFD during the COVID-19 outbreak into three categories—customer satisfaction/experience, intention to use OFD apps, and workers/drivers/riders' conditions during operations of OFD.

The first set of studies (Kumar and Shah, 2021; Mehrolia et al., 2021; Prasetyo et al., 2021; Sharma et al., 2021) focused on customer experience and OFD companies' performance. Mehrolia et al. (2020) and

**Sharma et al. (2021)** investigated the characteristics of customers who used and did not use online food delivery services (OFDS) during the first wave of COVID-19 in India. Customers who purchased food via OFD platforms have experienced lesser perceived threats and a high purchase pattern, perceived benefits, and product involvement (**Al Amin et al., 2021; Mehrolia et al., 2021; Sharma et al., 2021; Uzir et al., 2021**). Studies found that during the COVID-19 pandemic, hedonic motivation (**Prasetyo et al., 2021; Sharma et al., 2021; Shah et al., 2021**), food quality, variety, and safety (**Dsouza and Sharma, 2021; Shah et al., 2021**), and mobile app information design/features (**Pal et al., 2021**) significantly affect customers satisfaction and loyalty. Hedonic motivation is also important for price, information quality, and promotion (**Prasetyo et al., 2021; Bao and Zhu, 2022; Shah et al., 2021; Sharma et al., 2021; Ramos, 2021; Pal et al., 2021**). Unlike other studies, **Zenetta et al. (2021)** found that hedonic motivation was not the most crucial factor for the continuance intention.

India is one of the most populated countries and was severely affected by the COVID-19. Several studies (**Dsouza and Sharma, 2021; Mehrolia et al., 2021; Pal et al., 2021**) have been conducted to understand OFD companies and customers' purchase behaviors in the Indian market. **Trivedi and Singh (2021)** found that Zomato received the most positive and less negative customer sentiments than other competitors, such as Swiggy in India. **Dsouza and Sharma (2021)** found that the food quality and safety measure of OFDAs positively affects customer satisfaction and loyalty in India. **Pal et al. (2021)** investigate student satisfaction and loyalty to OFDAs. Their findings suggest that satisfaction is the main predictor of loyalty, whereas mobile app information design has the highest impact on satisfaction and loyalty. **Chen McCain et al. (2021)** assessed customers' satisfaction with Uber Eats on different dimensions—OFD apps performance, food quality, and service quality during the first wave of COVID-19 in the US. They found that service quality was the most important dimension, followed by OFD app performance and food quality.

The second set of studies focused on the continuous usage intention of OFD apps during the COVID-19 outbreak period in different countries, such as India (**Mehrolia et al., 2021**), the USA (**Hong et al., 2021**), China (**Zhao and Bacao, 2020**), Brazil (**Zanetta et al., 2021**), Mexico (**Ramos, 2021**), Vietnam (**Tran, 2021**). These and several other studies have found that performance expectancy (**Mehrolia et al., 2021; Zanetta et al., 2021; Pal et al., 2021; Ramos, 2021**), habit (**Zanetta et al., 2021; Rydell and Kucera, 2021**), effort expectancy (**Kumar and Shah, 2021; Ramos, 2021; Pal et al., 2021**), price saving orientation (**van Doorn, 2020; Ramos, 2021; Pal et al., 2021**), perceived usefulness, and employee trust (**Gavilan et al., 2021; Chakraborty et al., 2022; Trivedi and Singh, 2021; Uzir et al., 2021**) affect consumers intention to use OFD services during the COVID-19 period.

Similarly, delivery, hygiene, subjective norms, attitudes, behavioral control, and social isolation (**Al Amin et al., 2021; Gani et al., 2021; Tran, 2021; Sharma et al., 2021; Yeo et al., 2021; Hopkins and Potcovaru, 2021**) positively affect the consumers' continuance intention to use Mobile food delivery apps. Further, studies have also found that OFD apps features, ease of use, convenience, price saving, and food variety (**Pigatto et al., 2017; van Doorn, 2020; Pal et al., 2021; Dirsehan and Cankat, 2021; Shah et al., 2021; Kumar et al., 2021; Bao and Zhu, 2022**) also affect the continued intention to use the FDA. **Gavilan et al. (2021)** found that customers preferred innovative solutions by OFD companies during COVID-19. **Kumar and Shah (2021)** observed that the app aesthetics were responsible for customers' pleasure, significantly affecting the customers' continued usage intent.

The third set of studies (**Huang, 2021; Parwez & Ranjan, 2021; Puram et al., 2021**) attempted to understand food delivery drivers' conditions during COVID-19 in China and India. The precarity of work among the food delivery workers had aggravated during COVID-19—and it impacted workers' job loss, health risks, and occupational distress (**Huang, 2021; Parwez & Ranjan, 2021**). Among drivers in China, work insecurity, financial distress, health risks, livelihood crisis,

and inflamed racism were also observed (**Huang, 2021**). **Puram et al. (2021)** analyzed the challenges faced by last-mile food delivery riders working for different OFD platforms in India during the COVID-19 pandemic. They categorize the riders' challenges under operational, customer-related, organizational, and technological categories.

Apart from the variables discussed above, several other variables moderate or affect customers' satisfaction (**Hu et al., 2009**), sentiments about the food delivery service (**Oliver, 1977; Gavilan et al., 2021**), and intent to use and reuse OFD services (**Mittal et al., 2001; Kim et al., 2021; Gani et al., 2021**). A large number of studies show that a firm's brand image (**Fornell, 1992; O'Sullivan and McCallig, 2012; Peng et al., 2015; Chai and Yat, 2019; Hwang and Kim, 2020; Prasetyo et al., 2021**) and market value/size (**Daniel et al., 2015; Dai et al., 2021**) positively affect customers satisfaction in different service industries. The customer's expectations about the OFD service performance may vary between different waves of the COVID-19 (**Sv et al., 2021; Mohan et al., 2022**). The geographic location of customers may affect their expectations and purchase intention about the product and service (**Steyn et al., 2010; Ng, 2013; Leng et al., 2019; Punel et al., 2019**). **Rizou et al. (2020)** found similar findings in the food delivery sector as well. Studies have explored the difference in people's sentiments during the first and second waves of the COVID-19 (**Lo Coco et al., 2021**).

None of the above studies utilize secondary data from social media platforms like Twitter, where customers regularly express their concerns, experience, and advice to OFD companies and their businesses. This data can help companies comprehensively understand customers' expectations and measure their performance during the pandemic. This paper addresses this issue by collecting consumer data on the top two Indian and US OFD companies from Twitter and exploring the issues OFD companies face by employing the text mining approach and regression analyses.

### 3. Research hypotheses development

In addition to the traditional OFD business market factors, several other variables may affect or moderate customers' sentiments about OFD companies' performance and service during the COVID-19. The variables and related hypotheses are discussed in the following subsections.

#### 3.1. The COVID-19 waves and people's sentiments

The COVID-19 pandemic brought havoc to everyone's life and affected people in different ways—financially, emotionally, psychologically, and physically (**Trivedi and Singh, 2021; Conte et al., 2021**). At the beginning of the COVID-19 outbreak (i.e., in the first wave), it was difficult for OFD companies and restaurants to run their business and serve customers efficiently and safely. In the first COVID-19 wave, most OFD companies were clueless about the customers' expectations of their delivery services and how to meet them. Due to safety reasons (**Zhao and Bacao, 2020**), customers with self-protective behavior were hesitant to order food online during the first COVID-19 wave (**Ahorsu et al., 2020**). The primary reasons for their safety concern were lack of information about hygiene, how and who is preparing food, ingredients used in foods, source of ingredients, and safety measures adopted at restaurants (**Gavilan et al., 2021**).

However, to address these concerns, soon, OFD companies started adopting government regulations, offered contactless delivery, and implemented several measures for customers' safety (**Nguyen and Vu, 2020**). During the first COVID-19 wave, OFD companies have learned to meet consumers' expectations in the best way possible. As COVID-19 time passed, OFD service providers started offering more information about safety measures adopted by them to consumers (**Keeble et al., 2021**). Therefore, in the second wave of COVID-19, companies' performance and consumers' sentiment about their performance should improve. Literature suggests a difference in people's sentiments between

the first and second wave of the COVID-19 (Kohút et al., 2021; Sv et al., 2021; Mohan et al., 2022), which also suggests people's psychological adoption of the new normal situation (Koppehele-Gossel et al., 2022) as well satisfaction with improved services of OFD firms. We believe customers' sentiments on the operations of OFD companies (Kim et al., 2021) should vary from COVID-19 first to the second wave. Therefore, we hypothesized:

**H1.** COVID-19 waves moderate people's sentiments.

### 3.2. Market size and public listing impact on people's sentiments

From the expectancy theory perspective (Oliver, 1977), customers will have specific expectations from a firm based on their previous experiences, influencing their behaviors to achieve specific goals. Before the COVID-19 outbreak, OFD companies with a bigger market size and listed publicly may have provided better customer experiences. Customers would be expecting similar services during the COVID-19 period as well. Some OFD companies (e.g., Zomato and Grubhub) are publicly listed and have a better brand value than others (Savitri et al., 2020; Yao et al., 2021). OFD companies with more resources can invest liberally to bring innovation to delivery operations to handle the COVID-19 healthcare crisis and market them to the consumers. Different innovative OFD options are discussed in the literature (Keeble et al., 2020; Richardson, 2020; Shah et al., 2021; Sharma et al., 2021; Bao and Zhu, 2022), which helps in reducing customers' fear of safety concerns and increases their experiential value (Gavilan et al., 2021) during COVID-19. Such companies can be more successful in conveying their safety-related measures to consumers.

Numerous studies (O'Sullivan and McCallig, 2012; Peng et al., 2015) have investigated how a firm's value affects customer satisfaction. Bolton et al. (2004) and Luo et al. (2010) found that customer satisfaction significantly affects the firm's value in the stock market and vice-versa. It is established in the literature that high firm value not only helps increase customer satisfaction (Hu et al., 2009) but also enhances its brand image (Prasetyo et al., 2021), purchase and repurchase intention (Bao and Zhu, 2022), customer retention (Mittal et al., 2001), and reduces complaints (Fornell, 1992). Dai et al. (2021) studied the impact of the COVID-19 outbreak on small and medium-sized enterprises (SMEs) across different industries during the first and second waves. They found that during the second wave, companies were more prepared based on their learning from the first wave. Daniel et al. (2005) find a higher correlation between a firm's market values and customers' confidence in the firm. Based on the above studies, one can conclude that if a firm has a higher market size or value and is listed publicly, it leads to high customer confidence or sentiments in the firm.

**H2.** The market size of OFD companies moderates people's sentiments.

**H3.** Public listing of OFD companies moderates people's sentiments.

### 3.3. The brand image and people's sentiments

The brand image of a food company is crucial for customers to use their OFD service (Prasetyo et al., 2021). In the restaurant industry, brand image is defined as "emotions, ideas or attitudes that customers associate with full-service dining restaurants" (Jin et al., 2012). It is established in the literature that customers prefer to purchase products or services from well-known brands as they offer high-quality food (Aaker and Equity, 1991). During the COVID-19 outbreak, several restaurants have increased their presence on OFD platforms to increase brand awareness (Chai and Yat, 2019; Hwang and Kim, 2020). In general, a better brand image helps increasing consumer trust, purchase intention (Erdem and Swait, 2004), and customer satisfaction with a better service and quality (Baek et al., 2010). Aureliano-Silva et al. (2022) argued that brand love and service recovery are important for purchase intention and brand trust in food delivery platforms. Studies

show that brand love is instrumental to customer satisfaction and intentions for future purchases (Han et al., 2011; Erkmen and Hancer, 2019; Bao and Zhu, 2022).

Ibrahim et al. (2017) found a positive relationship between consumer sentiments on Twitter and the company's brand image. A positive brand image creates a good reputation for the company in customers' minds for a long time, and it increases customer loyalty toward a high brand image company (Pitta and Katsanis, 1995). Customers heavily rely on a company's brand image when they are concerned about uncertain product or service quality (Berry, 2000; Erdem and Swait, 2004), food safety, and quality under uncertain times like the COVID-19 outbreak (Kim et al., 2021). A company's brand image positively affects customer loyalty and is a significant predictor of customer satisfaction in the restaurant (Hwang and Kim, 2020) and other industries (Jin et al., 2012; Ryu et al., 2012; Faullant et al., 2008). The high brand image of a food delivery firm positively affects the customer's behavioral intention to use OFD service (Hwang and Choe, 2019; Gani et al., 2021). Therefore, we hypothesized:

**H4.** The brand image of OFD companies moderates people's sentiments.

### 3.4. Operating regions and people's sentiments

The customers' expectations about the same products and services may vary between different regions based on different factors such as behaviors, loyalty, attitudes, and cultural influence (Steyn et al., 2010). Punel et al. (2019) found that customers' experiences and expectations about the same airline service vary based on customers' geographical region. The authors find a difference in the North American and Asian passengers' expectations of the ticket price and in-flight service. Some studies show that cultural regions moderate online purchase intention (Ng, 2013). Leng et al. (2019) observed differences in the US and Japanese people's choices and expectations about food products and services.

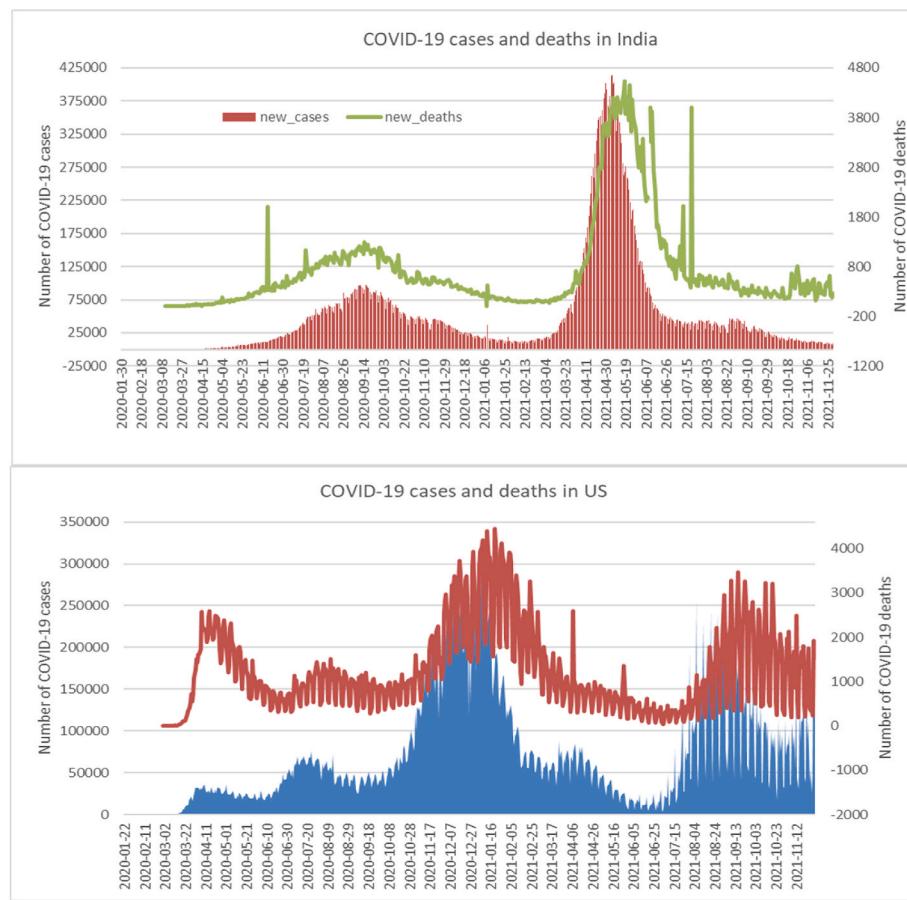
Twitter is a popular social media platform where people freely express their feelings. People's reactions on Twitter to the COVID-19 varied in different regions. For example, the US people's sentiment score was more negative than the UK people toward the COVID-19 (Zou et al., 2020). Similarly, the fear and awareness of the COVID-19 safety measures vary from country to country Rizou et al. (2020); Lo Coco et al. (2021). Consumers' expectations and sentiments about the OFD service providers may also vary according to their country (Keeble et al., 2020), as consumers in developed countries would be more educated and aware and, hence, have more expectations. In India, the OFD services business is growing exponentially. However, it is still new compared to the US market. Thus, OFD companies may focus more on consumer-centric service delivery in developed countries than in developing countries. Variation in the above factors should change customer sentiment. Therefore, we hypothesize that:

**H5.** Operating regions (i.e., countries) of OFD companies moderate people's sentiments.

## 4. Research methodology and results

We have collected consumer data for four popular OFD companies from India (e.g., Zomato and Swiggy) and from the US (e.g., Uber Eats and Grubhub). The consumer-level data were extracted from Twitter—a social networking site—on which billions of users express their ideas and experiences. Each post by a user is known as a "tweet". The customer-level data were collected between February 01, 2020 to November 30, 2021 covering the first two COVID-19 waves.

As shown in Fig. 1, in India, the first COVID-19 wave is considered from March 01, 2020 to February 28, 2021 and the second wave is considered from March 01, 2021 to November 30, 2021. For the US, the first wave is considered from February 01, 2020 to June 30, 2021 and



**Fig. 1.** COVID-19 cases and deaths in India and US.

the second wave is considered from July 01, 2021 to November 30, 2021. The second wave in India brought more negative impacts as the number of new daily cases and fatality rate were significantly higher than the first wave. The second wave inflicted more fear on people's minds as the number of people hospitalized, and the load on medical infrastructure were significantly higher than the first wave of COVID-19.

Fig. 2 summarizes the research methodology adopted in this paper. Primarily, a four steps method was utilized for: (i) data collection, (ii) topic extraction, (iii) sentiment analysis, and (iv) moderation variable analysis. We used the company name, their Twitter handle, and related hashtags as keywords to extract the data. We extracted a total sample of 11,134 for Zomato, 14,355 for Swiggy, 15,583 for Uber Eats, and 2030 for Grubhub. The data were preprocessed by employing language identification, cleaning, tokenization, lemmatization, and removing stopwords. We kept data in English for further analysis, leading to a useful sample of 9447 for Zomato, 13,160 for Swiggy, 12,536 for Uber Eats, and 1951 for Grubhub. The remaining three steps are described in subsections 4.1, 4.2, and 4.3.

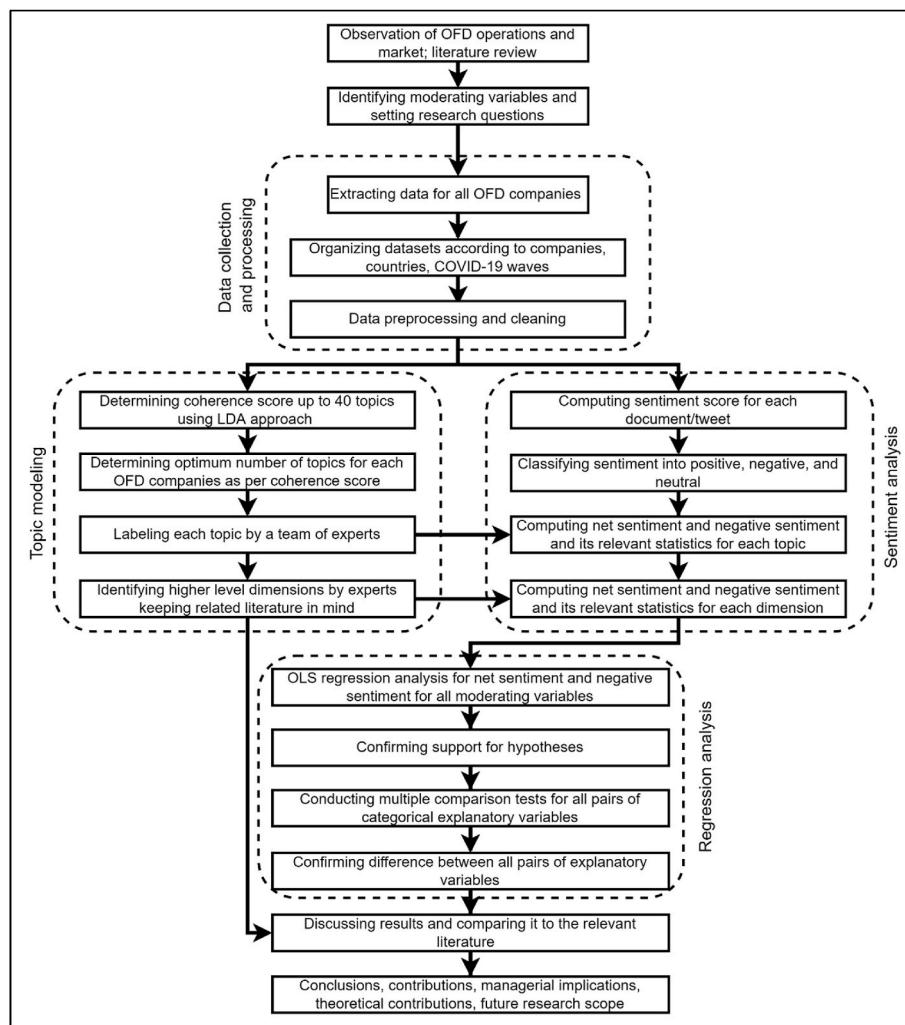
#### 4.1. Text analytics and topic extraction

We employed the latent Dirichlet allocation (LDA) tool (Blei et al., 2003) to identify hidden topics discussed in the large volume of unstructured data, as it does not assume any structure of grammar properties. The model was trained to identify the number of topics in unstructured documents. The extant literature (Nikolenko et al., 2017; Lee, 2022) suggests a coherence score as a more reliable measure to discover the most prominent number of topics in a large volume of documents. Fig. 3 shows the variation of coherence score over topics 2 to 40 for each OFD company.

We found the highest coherence score for each OFD company when the number of topics extracted was 13 for Zomato, 6 for Swiggy, 2 for Uber Eats, and 11 for Grubhub. We believe that there must be more than two topics related to Uber Eats discussed by customers, so we preferred to extract topics that correspond to the next highest coherence score. It results in 7 topics for Uber Eats. Topics and their associated 10 most important keywords of Zomato, Swiggy, Uber Eats, and Grubhub are presented in Tables 1–4, respectively.

Topics extraction results are analyzed in three steps: (i) an expert team reviewed keywords of each topic and gave an appropriate name, as shown in Tables 1–4, (ii) each topic was then reviewed and higher dimensions which were a collection of topics were formed (see Tables 1–4), keeping literature in mind, and (iii) based on percent tweets related to the dimensions (see Table 5), most prominent dimensions of each food delivery company and regions were identified and discussed in Section 5. To label topics, the keywords of each topic were discussed and reviewed carefully by experts from academics. Further, we observed that a set of topics represents a higher-level dimension. Thus, we identified sets of topics representing higher-level dimensions. These dimensions are also shown in Tables 1–4.

Further, we also extracted topics based on the COVID-19 waves to check if there is any difference in topics. The results show that in India, people discussed more regarding help and support for drivers and restaurants, vaccination requests, customized orders, and food quality in the second COVID-19 wave. In the first wave, we observed more discussion about consumers' perceived responsibility, perceived solutions, and companies' social responsibility. On the other hand, US people discussed more about coupons and promocode during the first COVID-19 wave. Whereas in the second wave, people emphasize more about vaccination, money spending, and delivery operations in the US market.



**Fig. 2.** The proposed research methodology framework.

#### 4.2. Sentiment analysis

Sentiment analysis is a procedure to quantify customers' experiences or emotions based on the subjective text data expressed by the customers (Lee, 2022). The sentiment was labeled based on the python package, Gensim/VADER. We preferred the VADER-based model as they provide a parsimonious rule -or lexicon-based model specially designed for social media text sentiment analysis. Social media text, especially tweets data, is characterized as short sentences/descriptions with emoji, copious use of question marks and exclamation marks, and repetitive words. This technique of unsupervised sentiment computation does not require features and is widely used in the literature (Ibrahim and Wang, 2019; Lee, 2022; Mehta et al., 2021).

Customer sentiment may include positive, negative, or neutral (Lee, 2022; Liu et al., 2021), depending upon VADER based compound score that varies from  $-1$  to  $+1$ . If the compound score was  $\leq -0.05$ , between  $-0.05$  and  $+0.05$ , and  $\geq +0.05$ , the sentiment was labeled as negative, neutral, and positive (Lee, 2022). Lexicon-based sentiment computation approach matches words with a dictionary of words. First, we assessed the sentiment score of each tweet. Subsequently, we assessed topic-level and dimension-level sentiments using dictionaries or a pre-defined list of words approach. The topic- and dimension-level sentiment was determined by averaging the tweet- and topic-level sentiments, respectively. Dimension-level positive and negative sentiments of delivery companies are shown in Table 5. Based on the mean score of positive and negative sentiment, the results are further discussed in section 5.

#### 4.3. Moderating variables

To test hypotheses, we considered two types of sentiment: net sentiment and negative sentiment, as response variables. Five important variables—COVID-19 wave, brand, market size, country, and listed, may influence customers' both types of sentiment/satisfaction. We employ the ordinal least square (OLS) regressions to estimate response variables, net sentiment, and negative sentiment. The relationship between the response variable and explanatory variables takes the form of equations (1) and (2).

$$\begin{aligned} \text{Customers' net satisfaction} = & \alpha_0 + \alpha_1 \text{Covid wave} + \alpha_2 \text{brand} + \alpha_3 \text{Market size} \\ & + \alpha_4 \text{Country} + \alpha_5 \text{Listed} + \varepsilon_0 \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Customers' negative sentiment} = & \alpha_{00} + \alpha_{11} \text{Covid wave} + \alpha_{22} \text{brand} \\ & + \alpha_{33} \text{Market size} + \alpha_{44} \text{Country} + \alpha_{55} \text{Listed} + \varepsilon_{00} \end{aligned} \quad (2)$$

The COVID-19 wave, country, and “listed” are binary variables. The COVID-19 wave has two labels—the first and the second wave. The country has two labels—India and US. Similarly, listed has labels yes and no, where yes implies a company is listed in the stock market, and no for otherwise. Zomato and Grubhub are publicly listed OFD companies, while Uber Eats and Swiggy are not. The brand and market size are categorical variables, where the brand has four labels—Zomato, Swiggy, Uber Eats, and Grubhub. The market size has three labels: small,

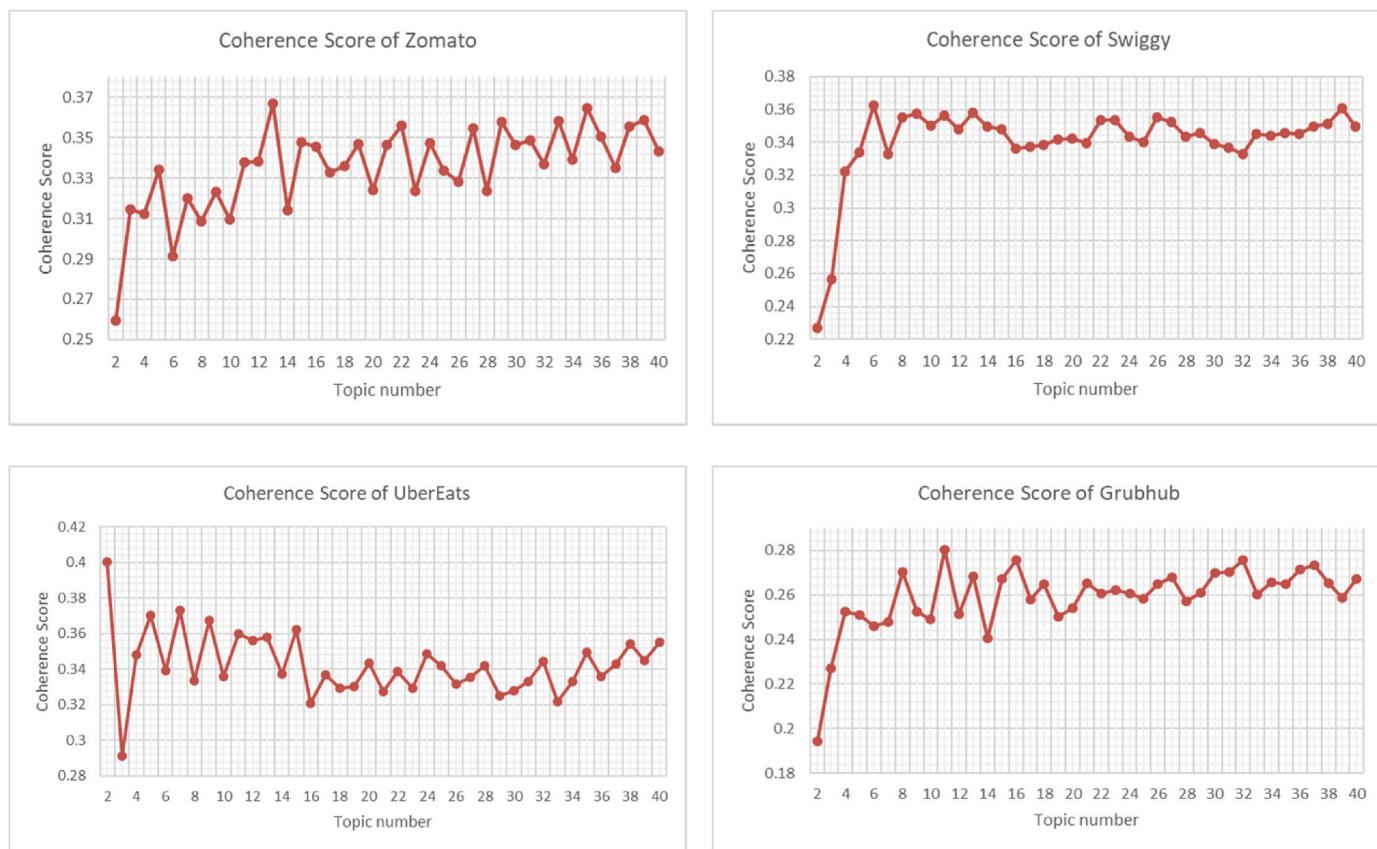


Fig. 3. Coherence score of each OFD company.

**Table 1**  
Keywords, topics, and dimensions of Zomato and their statistics.

Dimension	Topics	Keywords	Positive			Negative		
			mean	std	max	mean	std	max
Social responsibility	Help in providing food to needy during lockdown	daili, support, wager, donat, help, feed, provid, coronaviru, food, lockdown	0.14	0.119	0.505	0.076	0.091	0.651
	Impact of staff/workers' salary on food delivery business	employe, busi, impact, worker, deliveri, food, staff, swiggi, uber, salari	0.067	0.084	0.469	0.079	0.092	0.388
	Riders' help in delivering donated food and groceries	help, deliveri, work, groceri, delhi, donat, food, rider, launch, deliv	0.135	0.122	0.574	0.057	0.081	0.411
Delivery operations	Responsiveness of food delivery person	food, order, time, come, corona, foodi, think, action, carri, know	0.104	0.104	0.535	0.082	0.088	0.478
	Pizza and food delivery during home quarantine	deliveri, food, pizza, quarantin, isol, home, swiggi, posit, test, thank	0.117	0.117	0.672	0.061	0.068	0.351
	Customized food orders by following corona appropriate protocols	deliveri, corona, order, food, viru, custom, time, contactless, mask, deliv	0.108	0.101	0.571	0.087	0.096	0.573
Perceived responsibility of consumers	Stay home and order food from restaurants during quarantine time	order, food, swiggi, restaur, quarantin, corona, stay, time, deliv, stayhom	0.109	0.105	0.545	0.06	0.089	0.504
	Fight corona and save people's life by having food products delivered at home	corona, life, swiggi, quarantin, avoid, deliveri, indiafightscorona, soon, peopl, product	0.104	0.115	0.577	0.066	0.101	0.583
	Use food delivery services to stop spread of corona virus among people	food, corona, peopl, order, deliveri, stop, deliv, servic, spread, time	0.099	0.094	0.474	0.096	0.099	0.623
Financial impact of COVID-19	Loss of income in food delivery business nationally	food, hous, lose, nation, delivers, medicin, incom, leav, coronaviruspandem, live	0.037	0.078	0.415	0.078	0.063	0.302
	Consumers' purchase behaviors	corona, serv, thing, restaur, outbreak, gold, food, face, membership, lockdown	0.065	0.116	0.623	0.105	0.12	0.487
Perceived solutions	Indian food delivery startup business help fighting corona	swiggi, indian, corona, compani, startup, amazon, fund, fight, busi, flipkart	0.112	0.101	0.624	0.067	0.087	0.505
	Online food delivery order to stop corona virus spread	deliveri, swiggi, lockdown, coronaviru, home, corona, deliv, food, onlin, spread	0.076	0.088	0.412	0.047	0.073	0.636

medium, and large. With a nearly \$80.53 billion market cap, Uber Eats is considered a large-market size company. Zomato, Swiggy, and Grubhub, with a market cap of nearly \$13.82 billion, \$5 billion, and \$10.55

billion, are considered medium, small, and medium market sizes, respectively.

The ordinary least squares (OLS) regression results are presented in

**Table 2**

Keywords, topics, and dimensions of Swiggy and their statistics.

Dimension	Topics	Keys	Positive			Negative		
			Mean	Max	Std.	Mean	Max	Std.
Perceived consumers' responsibility	Stay home and have food delivered from restaurants during lockdown Online food delivery may help in reducing the corona virus spread among people	deliveri, home, food, corona, stay, restaur, work, lockdown, time, amazon deliveri, corona, food, viru, order, deliv, spread, peopl, onlin, like	0.108	0.594	0.109	0.058	0.503	0.08
Social responsibility	Help hungry (needy) people by a delivery chain through food delivery during corona	deliveri, corona, help, peopl, partner, fund, work, need, relief, hunger	0.128	0.67	0.111	0.071	0.512	0.081
Negative impact of COVID-19 on OFD business	Lockdown prevented/affected food delivery operations	lockdown, quarantin, order, oper, coronaviru, food, prevent, current, poor, foodi	0.106	0.778	0.117	0.035	0.375	0.06
	Negative impacts of corona virus on online food delivery business	employe, food, coronaviru, busi, deliveri, lockdown, uber, startup, impact, Indian	0.066	0.623	0.095	0.051	0.506	0.089
Delivery operations	More customized food orders (delivery time, service, refund) from restaurants during corona	order, custom, food, time, deliv, restaur, servic, corona, deliveri, refund	0.102	0.674	0.103	0.103	0.586	0.097

**Table 3**

Keywords, topics, and dimensions of Ubereats and their statistics.

Dimension	Topics	Keys	Positive			Negative		
			Mean	Std.	Max	Mean	Std.	Max
Importance of Coupon/promocode on food delivery order	Promocode accounts for more food orders during coronavirus Problems with discount coupons in food delivery order during quarantine	order, coronaviru, code, discount, quarantin, ubereatspromocod, promocod, account, ubereatsuk, coronavirusuk order, quarantin, spend, code, account, problem, discount, ubereatspromocodecod, vhoplook, vhopif	0.032	0.078	0.457	0.005	0.043	0.701
Financial impact of COVID-19	In quarantine, people think about working to get money	quarantin, peopl, netflix, week, money, think, work, isol, month, watch	0.093	0.101	0.808	0.081	0.096	0.603
Delivery operations	Drivers and restaurants' food delivery time and service	deliveri, food, driver, restaur, order, time, deliv, peopl, servic, leav	0.086	0.086	0.579	0.072	0.082	0.484
Free delivery service	Restaurants help local people by offering free delivery services during lockdown People want free home delivery during quarantine/coronavirus	deliveri, restaur, busi, help, support, local, servic, offer, free, lockdown corona, viru, quarantin, peopl, deliv, want, free, home, thank, stay	0.108	0.102	0.532	0.055	0.081	0.519
Perceived consumers' responsibility	Need for home food delivery to stay in isolation during the self-quarantine period	quarantin, self, isol, food, home, like, deliveri, deliv, stay, need	0.123	0.122	0.647	0.072	0.095	0.47
			0.104	0.103	0.612	0.084	0.095	0.613

**Table 4**

Keywords, topics, and dimensions of Grubhub and their statistics.

Dimension	Topics	Keys	Positive			Negative		
			mean	std	max	mean	std	max
People's supports in adapting to pickup/takeout service	Avail takeout and pickup service for food and alcohol	deliveri, coronaviru, food, takeout, pickup, chicagoindustri, alcohol, avail, dinneridea, luckysandwich	0.068	0.103	0.512	0.037	0.101	0.730
	Restaurants and drivers need local support to provide service	restaura, food, deliveri, support, servic, order, driver, local, need, like	0.130	0.112	0.552	0.075	0.088	0.519
Food delivery operations	Longer delivery time caused order cancellation People like food order delivered on time from restaurants and drivers	order, driver, quarantin, food, time, know, like, deliveri, cancel, deliv deliveri, quarantin, time, deliv, restaur, order, driver, food, like, busi	0.091	0.089	0.355	0.083	0.091	0.463
	People want home food delivery from restaurants and drivers	food, deliveri, quarantin, want, order, peopl, driver, like, restaur, home	0.116	0.106	0.458	0.078	0.094	0.574
Free delivery service	Restaurant food delivery offers needed to save people People like free food delivery offers during corona spread	restaura, corona, deliveri, quarantin, save, peopl, money, deliv, need, offer deliveri, food, corona, deliv, peopl, like, quarantin, spread, free, offer	0.101	0.115	0.532	0.094	0.115	0.5
	Thank gift card to food delivery drivers for risking their life during corona	deliveri, quarantin, driver, risk, gift, compani, order, card, thank, meal	0.143	0.122	0.55	0.054	0.072	0.279
Appreciation for drivers/restaurants for delivery service	Thanking drivers for working, wearing masks, and delivery service Delivery drivers working during the COVID-19 outbreak help greatly people and restaurant business	peopl, deliveri, mask, food, thank, come, servic, work, like, wear quarantin, work, driver, order, busi, help, peopl, start, great, restaur	0.124	0.115	0.496	0.084	0.093	0.351
	Need to thank restaurants and drivers for offering free food delivery	order, deliveri, quarantin, food, driver, free, thank, place, need, restaur	0.123	0.11	0.527	0.091	0.101	0.474
			0.119	0.12	0.633	0.068	0.087	0.522
			0.132	0.116	0.548	0.084	0.1	0.513

**Table 5**

Performance of delivery companies across different dimensions.

Dimension	count	Percent	positive				negative			
			mean	std	min	max	mean	std	min	max
<i>Dimensions of Zomato and their sentiments statistics</i>										
S. responsibility	1803	19.08%	0.110	0.113	0	0.574	0.071	0.089	0	0.651
Delivery operations	2367	25.06%	0.110	0.107	0	0.672	0.078	0.088	0	0.573
P. C. responsibility	2579	27.30%	0.104	0.101	0	0.577	0.078	0.097	0	0.623
Financial impact	119	1.26%	0.037	0.078	0	0.415	0.078	0.063	0	0.302
Consumers PB	515	5.45%	0.065	0.116	0	0.623	0.105	0.12	0	0.487
P. solutions	2064	21.85%	0.089	0.095	0	0.624	0.054	0.079	0	0.636
<i>Dimensions of Swiggy and their sentiments statistics</i>										
S. responsibility	1796	13.65%	0.128	0.111	0	0.67	0.071	0.081	0	0.512
Delivery operations	2785	21.16%	0.102	0.103	0	0.674	0.103	0.097	0	0.586
P. -ve impact	2963	22.52%	0.078	0.104	0	0.778	0.046	0.082	0	0.506
P. C. responsibility	5616	42.67%	0.109	0.103	0	0.6	0.062	0.08	0	0.536
<i>Dimensions of Ubereats and their sentiments statistics</i>										
Promocode and food delivery	1790	14.28%	0.031	0.075	0	0.496	0.052	0.066	0	0.701
Delivery operations	3817	30.45%	0.086	0.086	0	0.579	0.072	0.082	0	0.484
Financial impact	2058	16.42%	0.093	0.101	0	0.808	0.081	0.096	0	0.603
Fee delivery	2579	20.57%	0.115	0.112	0	0.647	0.063	0.088	0	0.519
P. C. responsibility	2292	18.28%	0.104	0.103	0	0.612	0.084	0.095	0	0.613
<i>Dimensions of Grubhub and their sentiments statistics</i>										
Adapting to pickup service	391	20.04%	0.110	0.113	0	0.552	0.063	0.094	0	0.73
Delivery operations	640	32.8%	0.103	0.096	0	0.458	0.078	0.088	0	0.574
Free delivery	282	14.45%	0.126	0.121	0	0.55	0.071	0.094	0	0.500
Appreciation for drivers/restaurants	638	32.7%	0.124	0.115	0	0.633	0.081	0.095	0	0.522

**Table 6**

OLS regression results for hypotheses.

Hypotheses	Response variable	Explanatory variable	F-statistic	Prob (F-statistic)	Conclusion
H1	Net sentiment	COVID waves	6.225	0.0126	Supported
H4	(Positive – Negative)	Brand	35.33	0.00	Supported
H2		Market size	47.17	0.00	Supported
H5		Country	52.12	0.00	Supported
H3		Listed	3.37	0.0663	Supported
H1	Negative	COVID waves	29.10	0.00	Supported
H4		Brand	6.623	0.00018	Supported
H2		Market size	9.525	0.00	Supported
H5		Country	1.853	0.173	Not Supported
H3		Listed	13.20	0.00	Supported

**Table 6.** The results show that there is a significant relationship between net sentiment and explanatory variable, the COVID waves ( $p < 0.05$ ), brand ( $p < 0.05$ ), market size ( $p < 0.05$ ), country ( $p < 0.05$ ), and listed ( $p < 0.10$ ). Thus, the hypotheses H1, H2, H3, H4, and H5 are supported for the net sentiment. For the negative sentiment, we found that all the explanatory variables are significant ( $p < 0.05$ ) except the country ( $p > 0.10$ ). Therefore, hypotheses H1, H2, H3, and H4 are supported for the negative sentiment; hypothesis H5 is rejected.

To identify specific pairs of groups that differ from each other, we conducted the Post-Hoc test of multiple comparisons of means—Tukey Honestly Significant Difference (Tukey HSD). The results are shown in Table 7 and discussed in the Discussion section.

## 5. Discussions and managerial implications

The topic modeling results (from Tables 1–4) convey the prominence of 13 topics for Zomato, 6 topics for Swiggy, 7 for Uber Eats, and 11 for Grubhub. These topics are further used to form higher-level dimensions that resulted—6 dimensions for Zomato, 4 dimensions for Swiggy, 5 dimensions for Uber Eats, and 4 dimensions for Grubhub. We find a wide

range of topics (and dimensions) relating to OFD companies were expressed and discussed during the COVID-19 pandemic. Delivery operations, social responsibility, perceived consumers responsibility, the financial impact of COVID-19 on consumers, consumers perceived behaviors, perceived solutions, perceived negative impact of OFD, promocode and food delivery, free delivery, adapting to pickup/takeout service, and appreciation for drivers/restaurants are dimensions that emerged from our analysis.

As count or percent contribution is shown in Table 5, overall, perceived consumer responsibility, delivery operations, social responsibility, perceived negative impact, free delivery, etc., are the most prominent dimensions related to OFD companies across emerging and developed countries. These findings differ from the previous literature (Chen McCain et al., 2021; Dsouza and Sharma, 2021; Shah et al., 2021; Trivedi and Singh, 2021) that observed food quality and safety measures, socialization, and marketing are the main themes for OFD companies during COVID-19. Our topics seem more enlightening and COVID-19 pandemic-oriented rather than topics related to the usual expectations from OFD companies. Reasons for the difference may be due to the fact that this study is more comprehensive in terms of the number of companies included, the sample size considered, and the time period during which the sample was collected.

Table 5 further conveys that the mean score of the positive sentiment of most dimensions is more than the mean score of a negative sentiment of most dimensions of all OFD companies. Exceptions to this are financial impact and consumers' perceived behaviors of Zomato; delivery operations of Swiggy; promocode and food delivery of Uber Eats. These findings are different from the findings of Chen McCain et al. (2021) in the sense that they found that negative sentiment is more than positive sentiment.

Most of the identified topics for Indian firms Zomato and Swiggy belong to delivery operations, social responsibility, and perceived consumer responsibility dimensions (see Table 1). However, most of the topics of Uber Eats operating in the US belong to promocode/coupon on food delivery orders and free delivery. In contrast, for Grubhub, most topics belong to the appreciation of drivers/restaurants for delivery service and food delivery operations. Interestingly, a closer look at the

**Table 7**

Multiple comparison test results.

Response variable	Explanatory variable	Group1	Group2	Mean difference	p-adj	Lower bound	Upper bound	Reject Hypothesis <sup>a</sup>	
Negative	Net sentiment (positive – negative)	COVID waves	First	0.005	0.0126	0.0011	0.009	True	
		Brand	Grubhub	-0.0048	0.5232	-0.014	0.0043	False	
		Grubhub	Ubereats	-0.0223	0.001	-0.0315	-0.0132	True	
		Grubhub	Zomato	-0.0125	0.0036	-0.0219	-0.0031	True	
		Swiggy	Ubereats	-0.0175	0.001	-0.0222	-0.0128	True	
		Swiggy	Zomato	-0.0076	0.001	-0.0127	-0.0025	True	
	Market size	Ubereats	Zomato	0.0099	0.001	0.0047	0.015	True	
		High	Low	0.0175	0.001	0.0132	0.0218	True	
		High	Medium	0.012	0.001	0.0075	0.0165	True	
		Low	Medium	-0.0055	0.0098	-0.0099	-0.0011	True	
		Country	India	USA	-0.0113	0.001	-0.0144	-0.0082	True
		Listed	No	Yes	0.003	0.0663	-0.0002	0.0063	False
	COVID waves	First	Second	0.0065	0.001	0.0041	0.0089	True	
		Brand	Grubhub	-0.0066	0.0118	-0.0121	-0.0011	True	
		Grubhub	Ubereats	-0.0039	0.268	-0.0094	0.0016	False	
		Grubhub	Zomato	-0.002	0.7771	-0.0076	0.0037	False	
		Swiggy	Ubereats	0.0027	0.0737	-0.0002	0.0055	False	
		Swiggy	Zomato	0.0046	0.001	0.0015	0.0076	True	
	Market size	Ubereats	Zomato	0.0019	0.3891	-0.0012	0.005	False	
		High	Low	-0.0027	0.0413	-0.0052	-0.0001	True	
		High	Medium	0.0022	0.1212	-0.0004	0.0049	False	
		Low	Medium	0.0049	0.001	0.0023	0.0076	True	
		Country	India	USA	0.0013	0.1734	-0.0006	0.0031	False
		Listed	No	Yes	0.0036	0.001	0.0017	0.0056	True

<sup>a</sup> Represents difference in Group 1 and Group 2.

topics and dimensions of Zomato and Swiggy conveys that people in India are more concerned about society, such as the social responsibility of OFD companies and the responsibility of consumers to society in such a hard time. People are more inclined toward spreading awareness and highlighting the responsibility of both consumers and delivery companies. As expected for OFD companies, we also found people discussing delivery operations dimension concerning to responsiveness of OFD companies and customized orders by following COVID-19 appropriate behaviors. Results in Table 5 show that perceived customer responsibility, delivery operations, and social responsibility are the three most prominent dimensions in the Indian market. On the other hand, delivery operations, fee delivery, and perceived customer responsibility are the three most prominent dimensions in the US.

Table 8 shows our identified dimensions and compares them with dimensions discussed in the literature. We observe that most of the existing studies (Kim et al., 2021; Pal et al., 2021) deal with the operational aspect of delivery, while a few studies (Li et al., 2020; Yeo et al., 2021) highlight the sustainability aspect of OFD companies, discount and promotion (Kim et al., 2021), and concerned for drivers (Huang, 2021; Ramos, 2021). However, we find perceived customer responsibility (contributing 28.27 percent) is the most important dimension, followed by delivery operations (contributing 25.9 percent) during the COVID-19 (see Table 5). Interestingly, compared to the existing literature, this study finds perceived consumers' responsibility, COVID-19 impacts on delivery business, benefits of competition, free food delivery service, and pickup/takeout services as unique concerns expressed and discussed by customers during the COVID-19 pandemic. During the COVID-19 pandemic, customers in India want OFD companies to be more socially sensitive, while US customers are concerned about discounts, coupons, free food delivery, etc.

We further observed that the net sentiment (i.e., positive-negative) differs across COVID-19 waves, brands, market sizes, countries, and listed (see Tables 6 and 7). Net sentiment during the second COVID-19 wave is significantly higher than that of the first COVID-19 wave. However, we also found that negative sentiment in the second wave (0.0761) was higher than in the first wave (0.0696) and significantly different ( $p < 0.05$ ). It conveys that even though negative sentiment increased in the second wave, OFD companies have used their learning and experiences from the first wave and therefore could improve net sentiment during the second wave of COVID-19. Our findings are

**Table 8**

Identified dimensions in this study and comparison with dimensions in literature.

Companies	Identified dimensions	Related dimension in literature
Zomato, Swiggy	Social responsibility	OFDA Sustainability (Li et al., 2020) Social influence (Yeo et al., 2021; Zanetta et al., 2021; Sharma et al., 2021; Zahao & Bacoa, 2020)
Zomato, Swiggy, UberEats, GrubHub	Delivery operations	Delivery Operations (Kim et al., 2021) Delivery Performance (Chen McChain et al., 2021) System Operational Transparency (Cheng et al., 2021) Delivery quality (Pal et al., 2021) Order and delivery (Trivedi and Singh, 2021) Food delivery hygiene (Tran, 2021)
Zomato, Swiggy, UberEats	Perceived customers' responsibility	Discounts on delivery (Kim et al., 2021)
Zomato, Swiggy, UberEats	Financial impact of COVID-19	Price and Promotion (Prasetyo et al., 2021)
Zomato	Benefits of competition	
UberEats	Importance of Coupon/promocode on food delivery order	
UberEats, Grubhub	Free food delivery service	
Grubhub	Pick up/takeout service	Drivers' safety (Huang, 2021; Parwez & Ranjan, 2021)
Grubhub	Appreciation or support for drivers service	Drivers work-life (Ramos, 2021) Solidarity with riders (Tassinar & Maccarrone, 2020)

different from the literature (Hong et al., 2021) that finds no moderation effect of COVID-19 on the relationship between explanatory variables and intention to use OFD apps. We find that COVID-19 waves significantly influence customer sentiment, which aligns with the literature

(Birtus and Lăzăroiu, 2021; Mehrolia et al., 2021; Watson and Popescu, 2021), that observed that COVID-19 reshaped customers behaviors, attitude, and expectations.

Analyzing net sentiment across brands, we find that except for Grubhub and Swiggy ( $p > 0.05$ ), all other pairs of brands are significantly different based on the net sentiment. Grubhub's mean net sentiment (0.0398) is significantly higher ( $p < 0.05$ ) than Uber Eats (0.0175) and Zomato (0.0274). It shows that Grubhub performed better than other OFD companies. Swiggy received the second-highest mean net sentiment score (0.035), which is significantly higher ( $p < 0.05$ ) than the net sentiment of Uber Eats and Zomato (see Table 7). Finally, Zomato's net sentiment is significantly higher ( $p < 0.05$ ) than Uber Eats. Overall, Grubhub received the highest net sentiment, which is significantly higher than all other OFD companies. In India, Swiggy performed better than Zomato, whereas Grubhub did better than Uber Eats in the US. Grubhub also received the highest negative sentiment (0.07489), followed by Zomato (0.0729), Uber Eats (0.0710), and Swiggy (0.0683).

Table 7 further conveys that Grubhub's and Zomato's negative sentiments are significantly ( $p < 0.05$ ) higher than Swiggy's negative sentiments. The negative sentiment of the remaining pair of companies does not differ significantly. Our findings indicate that brands play an important role in driving customer sentiment. This finding is aligned with previous literature (Gani et al., 2021) that observed that restaurant reputation influences OFD apps' usefulness during the COVID-19 pandemic. These findings are different from the literature (Prasetyo et al., 2021) that discovers restaurant credibility does not impact the intention to use OFD apps. It also differs from Trivedi and Singh (2021), who observed more positive and less negative sentiment for Zomato than Swiggy.

Observing the importance of market size, we found that OFD companies with low, medium, and large market sizes received a mean net sentiment score of 0.0350, 0.0295, and 0.0175, respectively. Further, Table 7 clearly shows that low and medium market size companies have significantly higher ( $p < 0.05$ ) mean net sentiment scores than large market size companies. This interesting finding conveys that low or medium market size companies can do better and receive better customer appreciation if they perform better during a crisis or on special customer demands.

We further observed that the medium market size company received the highest negative sentiment (0.0732), followed by large (0.071) and small market share (0.068). The negative sentiment of medium and large companies is significantly ( $p < 0.05$ ) higher than those with small market sizes. It conveys that smaller companies may satisfy customers more in odd times than bigger companies. It may be because smaller companies might be delivering more customer-friendly services as they may be determined to increase their market share by satisfying customers. Challenging times like the COVID-19 pandemic can be used as an opportunity to create more customer-based value. Our findings are different from the literature (De Mendonca and Zhou, 2019) that says larger companies can generate higher profit and customer satisfaction. Our results are more contextual and complex than the literature that says companies with higher market value may positively influence customers' perception (Hu et al., 2009) and repurchase intention (Bao and Zhu, 2022).

Analyzing results at the country level, we noticed that the mean net customer sentiment scores in India and the US are 0.0318 and 0.0205, respectively. Table 7 further confirms that India's net sentiment score is significantly higher ( $p < 0.05$ ) than the US. As the US is a developed country with excellent infrastructure and customer-based operations are more prevalent—one may expect better customer satisfaction and customer experience from OFD companies in the US. However, interestingly, we find customers are more satisfied with OFD companies in India than in the US. These findings are in line with previous studies (Charm et al., 2020; Steyn et al., 2010) that found customer sentiments vary greatly across different countries. Consumers in India, China, and Indonesia display more optimism than in the US (and the rest of the

world) (Charm et al., 2020). As far as negative sentiment is concerned, we find no significant difference ( $p > 0.10$ ). OFD companies in India and US attract similar negative sentiments. It may be because the challenges faced by the companies are almost the same, and the reasons for customers to get discontent are identical, especially in terms of sanitization and COVID-19 appropriate behaviors.

Further, we found mean net sentiment score of the publicly listed companies (0.0295) is significantly higher ( $p < 0.10$ ) than those of not listed companies (0.0264). Listed companies may have better perceptions and brand names that may positively influence customers' net sentiment. It is also possible that listed companies may adopt a more stakeholder-oriented approach (Hickman, 2019), bringing better customer experiences. These findings align with the literature (De Mendonca and Zhou, 2019; Hickman, 2019), highlighting that customers may be more loyal to publicly traded companies as they are more likely to be responsible to the environment and society. The negative sentiment of listed OFD companies (0.07325) also differs significantly ( $p < 0.05$ ) from unlisted companies (0.06964). Noticeably, the negative sentiment of listed companies is higher than that of unlisted companies. It is possibly because customers have more expectations from listed companies (Hickman, 2019) during the COVID-19 pandemic. Service delivery below the expectation may generate more negative sentiment. Our observations in terms of negative sentiment are different from the literature (Hickman, 2019).

## 6. Conclusions and future scopes

This study brings a deeper understanding of customers' experience of OFD companies operating in the COVID-19 pandemic, a worse health crisis globally. During the pandemic, thousands of people were quarantined, and the remaining people could not go out to have food in restaurants because of strict lockdowns. During this time, OFD companies delivered food to people who had different expectations from the companies than expectations during the normal time. Especially, sanitization, COVID-19 appropriate behaviors, and social responsibility were among the most important expectations of customers. The central theme of this paper is to explore how OFD companies performed during the COVID-19 pandemic and whether they performed up to the expectations. It also analyzed whether OFD companies' performance differs across emerging and developed countries and different COVID-19 waves. We collected consumer data from Twitter, conducted a qualitative and quantitative analysis to understand several intricacies of OFD companies' operations during the COVID-19 pandemic, and compared our findings with existing literature. This study throws several exciting findings.

The most talked-about topics were social responsibility, delivery operations, perceived consumer responsibility, financial impacts of COVID-19, etc. People in India and the US think differently regarding OFD service during such a hard time. People in India are more concerned about the responsibility of OFD and consumers towards society, but in the US, people discuss more about discounts, coupons, free food delivery, etc. Therefore, managers of OFD companies in India and the US should prioritize their services accordingly. Our findings convey to managers of OFD companies that customer expectations during a crisis are not usual expectations (such as prompt service, good taste, etc.); they expect something beyond. Therefore, managers must understand expectations first and deliver experience accordingly. A few previous studies demonstrated more generic expectations. Theoretically, we observe that dimensions of customer expectations during the COVID-19 crisis differ from normal times.

We further offer important theoretical contributions that the net sentiment of people differs across different COVID-19 waves, brands, market size, countries, and publicly listed (or unlisted) companies. OFD companies improved net sentiment in the second wave of COVID-19, perhaps by using their learnings from the first wave. Overall, Grubhub received the highest net sentiment as well as the negative sentiment.

Hence, to minimize negative sentiment, managers of Grubhub should align their service operations as per customer expectations. In India, Swiggy did better than Zomato. Managers of OFD companies should see the events like COVID-19 as opportunities where OFD companies with smaller market sizes also can do better than medium and large-market size companies. Customers are more satisfied in India than in the US; however, negative sentiment is almost equal in the two countries. The publicly listed OFD companies generate higher net sentiment as well as negative sentiment than those of unlisted companies. Hence, managers of listed OFD companies should control negative sentiment as per the performance on different topics identified. Interactions of COVID-19 waves, brands, market size, countries, and publicly listed (or unlisted) companies with net and negative sentiment of customers of OFD companies and its intricacies are interesting theoretical implications of this research.

This paper compares and contrasts OFD companies' consumer service and operations across emerging and developed countries and during the first and second waves of the COVID-19. By studying OFD during the COVID-19 pandemic, this study significantly and uniquely contributes to the existing literature (Huang, 2021; Kim et al., 2021; Yeo et al., 2021) on retailers and consumers. We identified new topics of importance during a hard time of the COVID-19 pandemic, which are entirely different from topics discussed before the COVID-19 outbreak. We further identified different variables which are significantly influencing customers' sentiment.

Like any other study, this paper also has some limitations. We mainly studied OFD companies operating in India and US by collecting customers' data from Twitter. Future studies can extend the scope of this study further. In addition to the US and Indian markets, it would be interesting to study people's sentiments and identify concerning dimensions about OFD companies' performance in the European and South American markets. Further, the inclusion of financial variables, such as revenue and profit for OFD companies' delivery performance, would be another exciting study. Nonetheless, this study documents the service and operations performance of OFD companies during the COVID-19 health crisis on a large scale which can be used for a future contingency plan. Finally, another promising problem for future studies is investigating how people's sentiment affects the OFD companies' performance in the stock market during the COVID-19 period.

## References

- Aaker, D.A., Equity, M.B., 1991. Capitalizing on the Value of a Brand Name, vol. 28, pp. 35–37. New York 1.
- Ahorsu, D.K., Lin, C.Y., Imani, V., Saffari, M., Griffiths, M.D., Pakpour, A.H., 2020. The fear of COVID-19 scale: development and initial validation. *Int. J. Ment. Health Addiction* 1–9.
- Al Amin, M.A., Arefin, M.S., Alam, M.R., Ahammad, T., Hoque, M.R., 2021. Using mobile food delivery applications during COVID-19 pandemic: an extended model of planned behavior. *J. Food Prod. Market.* 27 (2), 105–126.
- Aureliano-Silva, L., Spers, E.E., Lodhi, R.N., Pattanayak, M., 2022. Who loves to forgive? The mediator mechanism of service recovery between brand love, brand trust and purchase intention in the context of food-delivery apps. *Br. Food J.* <https://doi.org/10.1108/BFJ-07-2021-0819>.
- Baek, T.H., Kim, J., Yu, J.H., 2010. The differential roles of brand credibility and brand prestige in consumer brand choice. *Psychol. Market.* 27 (7), 662–678.
- Balakrishnan, V., 2020. Delhi food delivery boy tests positive for COVID-19: should you be ordering food from outside? This is what doctors feel. Indiana from. <https://timesofindia.indiatimes.com/life-style/health-fitness/diet/delhi-food-delivery-boy-tests-positive-for-COVID-19-should-you-be-ordering-food-from-outside-this-is-what-doctors-feel/articleshow/75180601.cms>. (Accessed 7 January 2021).
- Bao, Z., Zhu, Y., 2022. Why customers have the intention to reuse food delivery apps: evidence from China." *British Food Journal* (2021). *Br. Food J.* 124 (1), 179–196.
- Bates, S., Reeve, B., Trevena, H., 2020. A narrative review of online food delivery in Australia: challenges and opportunities for public health nutrition policy. *Publ. Health Nutr.* <https://doi.org/10.1017/S1368980020000701>.
- Berry, L.L., 2000. Cultivating service brand equity. *J. Acad. Market. Sci.* 28 (1), 128–137.
- Birtus, M., Lăzăroiu, G., 2021. The neurobehavioral economics of the COVID-19 pandemic: consumer cognition, perception, sentiment, choice, and decision-making. *Anal. Metaphys.* 20, 89–101.
- Blei, D.M., Ng, A.Y., Jordan, M.I., 2003. Latent dirichlet allocation. *J. Mach. Learn. Res.* 3, 993–1022.
- Bolton, R.N., Lemon, K.N., Verhoef, P.C., 2004. The theoretical underpinnings of customer asset management: a framework and propositions for future research. *J. Acad. Market. Sci.* 32 (3), 271–292.
- Boston Consulting Group, 2020. India's online food delivery industry to touch \$8-bn mark by 2022: Report. Business Standard. Accessed from. [https://www.business-standard.com/article/current-affairs/india-s-online-food-delivery-industry-to-touch-8-bn-mark-by-2022-report-120012800822\\_1.html](https://www.business-standard.com/article/current-affairs/india-s-online-food-delivery-industry-to-touch-8-bn-mark-by-2022-report-120012800822_1.html).
- Brewer, P., Sebby, A.G., 2021. The effect of online restaurant menus on consumers' purchase intentions during the COVID-19 pandemic. *Int. J. Hospit. Manag.* 94, 102777.
- Chai, L.T., Yat, D.N.C., 2019. Online food delivery services: making food delivery the new normal. *Journal of Marketing advances and Practices* 1 (1), 62–77.
- Chakraborty, D., Kayal, G., Mehta, P., Nunkoo, R., Rana, N.P., 2022. Consumers' usage of food delivery app: a theory of consumption values. *J. Hospit. Market. Manag.* 1–19.
- Charm, T., Grimmelt, A., Kim, H., Robinson, K., Lu, N., Ortega, M., 2020. Consumer sentiment is diverging across countries. McKinsey available at. <https://www.mckinsey.com/business-functions/growth-marketing-and-sales/our-insights/a-global-view-of-how-consumer-behavior-is-changing-amid-covid-19>. (Accessed 18 May 2022).
- Chen McCain, S.L., Lolli, J., Liu, E., Lin, L.C., 2021. An analysis of a third-party food delivery app during the COVID-19 pandemic. *Br. Food J.* <https://doi.org/10.1108/BFJ-03-2021-0332>.
- Cheng, C.C., Chang, Y.Y., Chen, C.T., 2021. Construction of a service quality scale for the online food delivery industry. *Int. J. Hospit. Manag.* 95, 102938.
- Correa, J.C., Garzon, W., Brooker, P., Sakarkar, G., Carranza, S.A., Yunado, L., Rincon, A., 2019. Evaluation of collaborative consumption of food delivery services through web mining techniques. *J. Retailing Consum. Serv.* 46, 45–50.
- Dai, R., Feng, H., Hu, J., Jin, Q., Li, H., Wang, R., Wang, R., Xu, L., Zhang, X., 2021. The impact of COVID-19 on small and medium-sized enterprises (SMEs): evidence from two-wave phone surveys in China. *China Econ. Rev.* 67, 101607.
- Daniel, K.D., Hirshleifer, D.A., Subrahmanyam, A., 2005. Investor psychology and tests of factor pricing models. Available at SSRN 854024.
- De Mendonca, T.R., Zhou, Y., 2019. Environmental performance, customer satisfaction, and profitability: a study among large U.S. Companies,. *Sustain. Multidiscip. Digit. Publish. Inst.* 11 (19), 5418.
- Dirsehan, T., Cankat, E., 2021. Role of mobile food-ordering applications in developing restaurants' brand satisfaction and loyalty in the pandemic period. *J. Retailing Consum. Serv.* 62, 102608.
- Dsouza, D., Sharma, D., 2021. Online food delivery portals during COVID-19 times: an analysis of changing consumer behavior and expectations. *Int. J. Innovat. Sci.* 13 (2), 218–232.
- Erdem, T., Swait, J., 2004. Brand credibility, brand consideration, and choice. *J. Consum. Res.* 31 (1), 191–198.
- Erkmen, E., Hancer, M., 2019. Building brand relationship for restaurants: an examination of other customers, brand image, trust, and restaurant attributes. *Int. J. Contemp. Hospit. Manag.* 31 (3), 1469–1487.
- Fauquant, R., Matzler, K., Fuller, J., 2008. The impact of satisfaction and image on loyalty: the case of Alpine ski resorts. *Manag. Serv. Qual.* 18 (2), 163–178.
- Fornell, C., 1992. A national customer satisfaction barometer: the Swedish experience,. *J. Market.* 56, 6–22.
- Gani, M.O., Faroque, A.R., Muzareba, A.M., Amin, S., Rahman, M., 2021. An integrated model to decipher online food delivery app adoption behavior in the COVID-19 pandemic. *J. Foodserv. Bus. Res.* 1–41.
- Gavilan, D., Balderas-Cejudo, A., Fernández-Lores, S., Martinez-Navarro, G., 2021. Innovation in online food delivery: learnings from COVID-19. *Int. J. Gastronomy Food Sci.*, 100330.
- Gilitwala, B., Nag, A.K., 2019. A study of factors influencing repurchase intention of online food delivery in Bangkok, Thailand. *Int. J. Emerg. Technol.* 10 (3), 193–201.
- Gunden, N., Morosan, C., DeFranco, A., 2020. Consumers' intentions to use online food delivery systems in the USA. *Int. J. Contemp. Hospit. Manag.* 32 (3), 1325–1345.
- Han, H., Kim, W., Hyun, S.S., 2011. Switching intention model development: role of service performances, customer satisfaction, and switching barriers in the hotel industry. *Int. J. Hospit. Manag.* 30 (3), 619–629.
- Hickman, L.E., 2019. Information asymmetry in CSR reporting: publicly-traded versus privately-held firms. *Sustainability Accounting. Manag. Policy J.* 11 (1), 207–232.
- Hong, C., Choi, H., Choi, E.K., Joung, H.-W.D., 2021. Factors affecting customer intention to use online food delivery services before and during the COVID-19 pandemic. *J. Hospit. Tourism Manag.* 48, 509–518.
- Hong, C., Choi, H.H., Choi, E.-K.C., Joung, H.-W.D., 2021. Factors affecting customer intention to use online food delivery services before and during the COVID-19 pandemic. *J. Hospit. Tourism Manag.* 48, 509–518.
- Hopkins, E., Potcovaru, A.M., 2021. Consumer attitudes, values, needs. *Anal. Metaphys.* 20, 202–215.
- Hu, H.H., Kandampully, J., Juwaheer, T.D., 2009. Relationships and impacts of service quality, perceived value, customer satisfaction, and image: an empirical study. *Serv. Ind. J.* 29 (2), 111–125.
- Huang, H., 2021. Riders on the storm: amplified platform precarity and the impact of COVID-19 on online food-delivery drivers in China. *J. Contemp. China* 1–15.
- Hwang, J., Choe, J.Y., 2019. Exploring perceived risk in building successful drone food delivery services. *Int. J. Contemp. Hospit. Manag.* 31 (8), 3249–3269.
- Hwang, J., Kim, H., 2020. The effects of expected benefits on image, desire, and behavioral intentions in the field of drone food delivery services after the outbreak of COVID-19. *Sustainability* 13 (1), 117.
- Ibrahim, N.F., Wang, X., 2019. A text analytics approach for online retailing service improvement: evidence from Twitter,. *Decis. Support Syst.* 121, 37–50.

- Ibrahim, N.F., Wang, X., Bourne, H., 2017. Exploring the effect of user engagement in online brand communities: evidence from Twitter. *Comput. Hum. Behav.* 72, 321–338.
- Jain, D., 2020. Effect of COVID-19 on restaurant industry—how to cope with changing demand. *Eff. COVID-19 Restaur. Ind. How Cope Chang. Demand.* <https://doi.org/10.2139/ssrn.3577764>. April 16, 2020.
- Jia, S.S., Raeside, R., Redfern, J., Gibson, A.A., Singleton, A., Partridge, S.R., 2021. #SupportLocal: how online food delivery services leveraged the COVID-19 pandemic to promote food and beverages on Instagram. *Publ. Health Nutr.* 24 (15), 4812–4822.
- Jin, N., Lee, S., Huffman, L., 2012. Impact of restaurant experience on brand image and customer loyalty: moderating role of dining motivation. *J. Trav. Tourism Market.* 29, 532–551.
- Keeble, M., Adams, J., Sacks, G., Vanderlee, L., White, C.M., Hammond, D., 2020. Use of online food delivery services to order food prepared away-from-home and associated sociodemographic characteristics: a cross-sectional, multi-country analysis. *Int. J. Environ. Res. Publ. Health* 17 (14), 5190.
- Kim, J., Kim, J., Wang, Y., 2021. Uncertainty risks and strategic reaction of restaurant firms amid COVID-19: evidence from China. *Int. J. Hospit. Manag.* 92, 102752.
- Kohút, M., Kohútová, V., Halama, P., 2021. Big Five predictors of pandemic-related behavior and emotions in the first and second COVID-19 pandemic wave in Slovakia. *Pers. Indiv. Differ.* 180, 110934.
- Koppehele-Gossel, J., Weinmann, L.M., Klimke, A., Windmann, S., Voss, U., 2022. Adapting to a major crisis: sleep and mental health during two lockdowns. *J. Sleep Res.* e13565.
- Kougiannou, N.K., Mendonça, P., 2021. Breaking the managerial silencing of worker voice in platform capitalism: the rise of a food courier network. *Br. J. Manag.* 32 (3), 744–759.
- Kumar, S., Shah, A., 2021. Revisiting food delivery apps during COVID-19 pandemic? Investigating the role of emotions. *J. Retailing Consum. Serv.* 62, 102595.
- Kumar, S., Jain, A., Hsieh, J.K., 2021. Impact of apps aesthetics on revisit intentions of food delivery apps: the mediating role of pleasure and arousal. *J. Retailing Consum. Serv.* 63, 102686.
- Lalvani, S., Seetharaman, B., 2020. The personal and social risks that India's food delivery workers are taking during COVID-19. *Wire from.* <https://thewire.in/business/COVID-19-food-delivery-workers>. (Accessed 21 December 2021).
- Leng, X., Ochi, M., Sakaki, T., Mori, J., Sakata, I., 2019. A cross-lingual analysis on culinary perceptions to understand the cross-cultural difference. *AAAI Spring Symp. Interpretable AI Well-being.*
- Li, C., Mirosa, M., Bremer, P., 2020. Review of online food delivery platforms and their impacts on sustainability. *Sustainability* 12 (14), 5528.
- Liu, S., Jiang, H., Chen, S., Ye, J., He, R., Sun, Z., 2020. Integrating Dijkstra's algorithm into deep inverse reinforcement learning for food delivery route planning. *Transport. Res. Part E* 142, 102070.
- Lo Coco, G., Gentile, A., Bosnar, K., Milovanović, I., Bianco, A., Drid, P., Pišot, S., 2021. A cross-country examination on the fear of COVID-19 and the sense of loneliness during the first wave of COVID-19 outbreak. *International. J. Environ. Res. Publ. Health* 18 (5), 2586.
- Luo, X., Homburg, C., Wieseke, J., 2010. Customer satisfaction, analyst stock recommendations, and firm value. *J. Market. Res.* 47 (6), 1041–1058.
- Mehrolia, S., Alagarsamy, S., Solaikutty, V.M., 2021. Customers response to online food delivery services during COVID-19 outbreak using binary logistic regression. *Int. J. Consum. Stud.* 45, 396–408.
- Mehta, M.P., Kumar, G., Ramkumar, M., 2021. Customer expectations in the hotel industry during the COVID-19 pandemic: a global perspective using sentiment analysis. *Tour. Recreat. Res.* 1–18.
- Michalikova, K.F., Blazek, R., Rydell, L., 2022. Delivery apps use during the COVID-19 pandemic: consumer satisfaction judgments, behavioral intentions, and purchase decisions. *Econ. Manag. Financ. Mark.* 17 (1), 70–82.
- Mittal, V., Anderson, E., Sayrak, A., Kamakura, W., 2001. Satisfaction, repurchase intent, and repurchase behavior: investigating the moderating effect of customer characteristics. *J. Market. Res.* 38, 131–142.
- Mohan, S., Solanki, A.K., Taluja, H.K., Singh, A., 2022. Predicting the impact of the third wave of COVID-19 in India using hybrid statistical machine learning models: a time series forecasting and sentiment analysis approach. *Comput. Biol. Med.* 144, 105354.
- NASSCOM, 2018. Catalyzing the ecosystem for a trillion-dollar digital economy. Hyderabad: Natl. Assoc. Software Serv. Co. from <https://nasscom.in/sites/default/files/NASSCOM-annual-guidance-fy-2018.pdf>. (Accessed 21 December 2021).
- National Restaurant Association, 2020. Coronavirus information and resource. Accessed from. <https://restaurant.org/Covid19>.
- Ng, C.S.P., 2013. Intention to purchase on social commerce websites across cultures: a cross-regional study. *Inf. Manag.* 50 (8), 609–620.
- Nguyen, T.H., Vu, D.C., 2020. Food delivery service during social distancing: proactively preventing or potentially spreading COVID-19? *Disaster Med. Public Health Prep.* 14 (3), e9–e10.
- Nikolenko, S.I., Koltcov, S., Koltsova, O., 2017. Topic modelling for qualitative studies. *J. Inf. Sci.* 43 (1), 88–102.
- Oliver, R.L., 1977. Effect of expectation and disconfirmation on postexposure product evaluations: an alternative interpretation. *J. Appl. Psychol.* 62 (4), 480.
- O'Sullivan, D., McCallig, J., 2012. Customer satisfaction, earnings and firm value. *Eur. J. Market.* 46 (6), 827–843.
- Pal, D., Funikul, S., Eamsinvattana, W., Siyal, S., 2021. Using online food delivery applications during the COVID-19 lockdown period: what drives University Students' satisfaction and loyalty. *J. Foodserv. Bus. Res.* 1–45.
- Pant, B., Shende, U., 2020. The Impact of COVID-19 on the sharing economy in India. <https://doi.org/10.2139/ssrn.3653008>.
- Parwez, S., Ranjan, R., 2021. The platform economy and the precarisation of food delivery work in the COVID-19 pandemic: evidence from India. *Work Organisa. Lab. Glob.* 15 (1), 11–30.
- Peng, C.L., Lai, K.L., Chen, M.L., Wei, A.P., 2015. Investor sentiment, customer satisfaction and stock returns. *Eur. J. Market.* 49 (5/6), 827–850.
- Pigatto, G., Machado, J.G.d.C.F., Negreti, A.D.S., Machado, L.M., 2017. Have you chosen your request? Analysis of online food delivery companies in Brazil. *Br. Food J.* 119 (3), 639–657.
- Pitta, D.A., Katsanis, L.P., 1995. Understanding brand equity for successful brand extension. *J. Consum. Market.* 12 (4), 51–64.
- Prasetyo, Y.T., Tanto, H., Mariyanto, M., Hanjaya, C., Young, M.N., Persada, S.F., Miraja, B.A., Redi, A.A.N.P., 2021. Factors affecting customer satisfaction and loyalty in online food delivery service during the COVID-19 pandemic: its relation with open innovation. *J. Open Innovat.: Technol. Market Complex.* 7 (1), 76.
- Punel, A., Hassan, L.A.H., Ermagun, A., 2019. Variations in airline passenger expectation of service quality across the globe. *Tourism Manag.* 75, 491–508.
- Puram, P., Gurumurthy, A., Narmetta, M., Mor, R.S., 2021. Last-mile challenges in on-demand food delivery during COVID-19: understanding the riders' perspective using a grounded theory approach. *Int. J. Logist. Manag.* <https://doi.org/10.1108/IJLM-01-2021-0024>.
- Raj, M., Sundararajan, A., You, C., 2021. COVID-19 and Digital Resilience. Evidence from Uber Eats NYU Stern School of Business, 2021. <https://doi.org/10.2139/ssrn.3625638>.
- Ramos, K., 2021. Factors influencing customers' continuance usage intention of food delivery apps during COVID-19 quarantine in Mexico. *Br. Food J.* 124 (3), 833–852.
- Research and Markets, 2021. Global online food delivery services market report 2021: COVID-19 growth. Impacts Change 2030. Accessed from. <https://www.marketresearch.com/Business-Research-Company-v4006/Online-Food-Delivery-Services-Global-14484234/>.
- Richardson, L., 2020. Platforms, markets, and contingent calculation: the flexible arrangement of the delivered meal. *Antipode* 52 (3), 619–636.
- Rizou, M., Galanakis, I.M., Aldawoud, T.M.S., Galanakis, C.M., 2020. Safety of foods, food supply chain and environment within the COVID-19 pandemic. *Trends Food Sci. Technol.* 102, 293–299.
- Roh, M., Park, K., 2019. Adoption of O2O food delivery services in South Korea: the moderating role of moral obligation in meal preparation. *Int. J. Inf. Manag.* 47, 262–273.
- Rydell, L., Kucera, J., 2021. Cognitive attitudes, behavioral choices, and purchasing habits during the COVID-19 pandemic. *J. Self Govern. Manag. Econ.* 9 (4), 35–47.
- Rydell, L., Suler, P., 2021. Underlying values that motivate behavioral intentions and purchase decisions: lessons from the COVID-19 pandemic. *Anal. Metaphys.* 20, 116–129.
- Ryu, K., Lee, H.R., Kim, W.G., 2012. The influence of the quality of the physical environment, food, and service on restaurant image, customer perceived value, customer satisfaction, and behavioral intentions. *Int. J. Contemp. Hospit. Manag* 24 (2), 200–223.
- Savitri, P.D., Krisnatuti, D., Hannan, S., 2020. The effect of innovation and marketing mix toward brand image and usage decision in online food delivery services industry. *Asia Pac. Manag. Bus. Appl.* 9 (2), 99–110.
- Seghezzi, A., Mangiaracina, R., 2020. On-demand food delivery: investigating the economic performances. *Int. J. Retail Distrib. Manag.* 49 (4), 531–549.
- Seghezzi, A., Winkenbach, M., Mangiaracina, R., 2021. On-demand food delivery: a systematic literature review. *Int. J. Logist. Manag.* 32 (4), 1334–1355.
- Shah, A.M., Yan, X., Qayyum, A., 2021. Adoption of mobile food ordering apps for O2O food delivery services during the COVID-19 outbreak. *Br. Food J.* <https://doi.org/10.1108/BFJ-09-2020-0781>.
- Sharma, R., Dhir, A., Talwar, S., Kaur, P., 2021. Over-ordering and food waste: the use of food delivery apps during a pandemic. *Int. J. Hospit. Manag.* 96, 102977.
- Smith, A., Machova, V., 2021. Consumer tastes, sentiments, attitudes, and behaviors related to COVID-19. *Anal. Metaphys.* 20, 145–158.
- Statista, 2021. Online food delivery: highlights. from. <https://www.statista.com/outlook/dmo/eservices/online-food-delivery/united-states>. (Accessed 22 December 2021).
- Steyn, P., Pitt, L., Strasheim, A., Boshoff, C., Abratt, R., 2010. A cross-cultural study of the perceived benefits of a retailer loyalty scheme in Asia. *J. Retailing Consum. Serv.* 17 (5), 355–373.
- Sundararajan, A., 2016. The Sharing Economy: the End of Employment and the Rise of Crowd-Based Capitalism. MIT Press, Cambridge.
- Sv, P., Ittamalla, R., Balakrishnan, J., 2021. Analyzing general public's perception on posttraumatic stress disorder and COVID-19: a machine learning study. *J. Loss Trauma* 1–3.
- Tiwari, S., Ram, S.G., Roy, S., 2019. 'What is it like to work in a gig economy job'. Indiana. Available from. <https://timesofindia.indiatimes.com/india/what-it-is-like-to-work-in-a-gig-economy-job/articleshow/69371217.cms>.
- Tran, V.D., 2021. Using mobile food delivery applications during the COVID-19 pandemic: applying the theory of planned behavior to examine continuance behavior. *Sustainability* 13, 1206.
- Trivedi, S.K., Singh, A., 2021. Twitter sentiment analysis of app based online food delivery companies. *Global Knowledge. Memory Commun.* 70 (8/9), 891–910.
- Uzir, M.U.H., Al Halbusi, H., Thurasamy, R., Hock, R.L.T., Aljaberi, M.A., Hasan, N., Hamid, M., 2021. The effects of service quality, perceived value and trust in home delivery service personnel on customer satisfaction: evidence from a developing country. *J. Retailing Consum. Serv.* 63, 102721.
- van Doorn, N., 2020. At what price? Labour politics and calculative power struggles in on-demand food delivery. *Work Organisation. Lab. Glob.* 14 (1), 136–149.

- Watson, R., Popescu, G.H., 2021. Will the COVID-19 pandemic lead to long-term consumer perceptions, behavioral intentions, and acquisition decisions? *Econ. Manag. Financ. Mark.* 16 (4), 70–83.
- Yang, Y., Liu, H., Chen, X., 2020. COVID-19 and restaurant demand: early effects of the pandemic and stay-at-home orders. *Int. J. Contemp. Hospit. Manag.* 32 (12), 3809–3834.
- Yao, Q., Zeng, S., Sheng, S., Gong, S., 2021. Green innovation and brand equity: moderating effects of industrial institutions. *Asia Pac. J. Manag.* 38 (2), 573–602.
- Yeo, S.F., Tan, C.L., Teo, S.L., Tan, K.H., 2021. The role of food apps servitisation on repurchase intention: a study of FoodPanda. *Int. J. Prod. Econ.* 234, 108063.
- Zanetta, L.D., Hakim, M.P., Gastaldi, G.B., Seabra, L.M.J., Rolim, P.M., Nascimento, L.G.P., Medeiros, C.O., da Cunha, D.T., 2021. The use of food delivery apps during the COVID-19 pandemic in Brazil: the role of solidarity, perceived risk, and regional aspects. *Food Res. Int.* 149, 110671.
- Zhao, Y., Bacao, F., 2020. What factors determining customer continuously using food delivery apps during 2019 novel coronavirus pandemic period? *Int. J. Hospit. Manag.* 91, 102683.
- Zou, C., Wang, X., Xie, Z., Li, D., 2020. Public reactions towards the covid-19 pandemic on Twitter in the United Kingdom and the United States. <https://doi.org/10.1101/2020.07.25.20162024>.