

Virtual Restaurants in COVID-19 Pandemic

Subjects: **Communication**

Contributor: Maria I. Klouvidaki , Nikos Antonopoulos , Georgios D. Styliaras , Andreas Kanavos

Due to COVID-19 restrictions, many restaurants were forced to discontinue in-person service, either by locking down or finding alternative methods of operation. Despite the fact that, in the United States of America, digital restaurants have already been established for many years, in Greece, this phenomenon became popular during the pandemic. These delivery-only companies operate exclusively online, allowing customers to place orders from restaurants without a physical location.

[digital marketing](#)

[virtual restaurant](#)

[ghost restaurant](#)

[ghost kitchen](#)

1. Introduction

Digital restaurants have started to emerge and gain popularity in Greece in their simplest form, earlier than in other countries. The study [1] focused on analyzing the use of social media for food and beverage marketing, including features such as 'marketing exposures by source', 'top food and beverage categories promoted by source', and 'top five companies that promote food and beverages'. The study found an increase in the exchange of unhealthy food and beverages among families on social media. Additionally, Canadian regulations do not recognize the potential health risks associated with exposure to poor-nutrient dishes at family gatherings, especially for children and young people who may be at risk of obesity. The study suggests that integrating social media and events into family regulations could be a potential solution to address childhood obesity.

Moreover, there are various fields today that lack an efficient menu display and ordering mechanism.

In addition to the emergence of digital restaurants and the analysis of social media for food and beverage marketing [1], digital media has also made its way into the world of gastronomy, transforming traditional restaurant menus. Printed menus are being replaced by digital menus, offering enhanced experiences for restaurant guests. However, there is a concern that the abundance of information provided through digital menus may overwhelm the guests [2].

To address the challenges faced by restaurants and optimize their operations, many establishments have turned to information and communication technology solutions. One such solution is the development and implementation of a wireless application. This application features a user-friendly interface with a dynamic menu card, accessible to customers through scanning a QR code. Customers can conveniently place their orders by logging in via Google API. The server then transmits the customer's request to the manager's desktop, which is further relayed to the kitchen staff either through a Kitchen Order Ticket (KOT) system or a dedicated interface for the chef [2].

The study conducted by [3] explored the impact of augmented reality (AR) on the restaurant industry by analyzing primary data collected through interviews with 15 restaurateurs from various countries.

2. The Coronavirus and Its Consequences in Restaurants

The culinary business in Indonesia is experiencing rapid growth and serves as a significant employer, employing a substantial number of people [4]. According to data from Kemenparekraf, the culinary sub-sector contributed IDR 455.44 trillion in 2020, accounting for nearly 41% of the entire creative economy GDP of IDR 1134 trillion [5]. Traditionally, paper-based menus have been the most common form in restaurants. The restaurant industry faces fierce competition from independent sandwich shops, cafes, coffee houses, pizzerias, fast-food chains, and high-end dining establishments, all offering diverse menu options. Restaurants play a vital role in the hospitality industry and serve as social gathering places [6].

However, this traditional approach has certain drawbacks, including the need for customers to wait in order to place their food orders and the unnecessary consumption of paper, as each customer requires a separate piece of paper to track their order [7]. In response to these challenges, digital restaurant menu systems have been developed as a solution to address these limitations.

The integration of augmented reality (AR) technology in restaurants offers several benefits for both restaurant owners and customers, as highlighted by the research conducted in [3]. One of the potential advantages is the expansion of customers' choices regarding the food offerings, accompanied by positive emotional experiences. The connection between AR and the food experience, engaging all five senses, has been recognized as important by both restaurant owners and customers, contributing to an enhanced overall dining experience [8]. However, it is crucial to note that improper use of AR can result in negative experiences for customers, as pointed out by [3]. Therefore, the implementation of a user experience (UX)-based strategy becomes essential to ensure positive outcomes for both customers and restaurants.

Customer experience has been identified as a critical factor for the commercial success of various sectors, including telecommunications, banks, tourism, and retail stores [9]. A UX-based strategy involves the utilization of various metrics, such as the Net Promoter Score (NPS), which measures the likelihood of customers recommending a company's products or services. Additionally, analyzing customers' emotions towards specific products and services can provide insights into the emotional state of a group of people within a city or even an entire country [10][11].

Considering the impact of the COVID-19 epidemic, it is likely that the future landscape of restaurants will differ from the pre-epidemic scenario. Strong digitalization efforts by restaurants have played a significant role, including investments in digital resources such as point-of-sale (PoS) devices, online ordering systems, and e-commerce platforms, as well as the development of new processes for pick-up, delivery, and low-contact interactions with customers. The widespread usage of videoconferencing, e-commerce, and other digital tools during the epidemic has made customers more willing than ever to embrace digital methods when visiting restaurants. This has led to

intensified competition and the emergence of unique solutions, such as remote ordering and personalization, to enhance the consumer experience [12].

In [13], the authors discuss the advancements in mobile technology that have led to the development of hypermedia spatial applications, which include graphics, videos, sounds, plain text, and hyperlinks. One of the areas where mobile devices have the potential to be utilized is in educational applications with multimedia modules. The modules can be easily exchanged, annotated, and reused through the spatial interface environment of mobile devices. The authors conduct a comprehensive review of existing spatial hypermedia interfaces and related environments, with a focus on their potential use in mobile educational platforms. They compare the essential features that should be supported by a mobile educational environment, such as content representation and relationships, spatial interface functions that utilize touch, and commenting functions.

To add more clarity and detail, the use of AR technology in food sciences has expanded in recent years. For instance, it has been used for food safety and quality control purposes by analyzing the chemical composition of food ingredients and detecting potential contaminants [13]. In the training activities of food production companies, AR has been implemented to simulate real-life situations and provide employees with practical experience without the risk of causing any harm to themselves or the products. Additionally, AR technology has been used in promoting and selling food products, both as unique items and meals through restaurants. By offering customers an interactive and engaging way to experience the products before purchasing, AR has been proven to increase customer engagement and satisfaction.

Moreover, the COVID-19 pandemic has necessitated the widespread adoption of digital technology across various industries, including the restaurant industry. As a response to the imposed limitations, restaurants have increasingly relied on digital solutions such as QR codes to present menus and the establishment of home delivery services through online platforms. Digital transformation has transitioned from being an option to a mandatory requirement for the survival and success of businesses in this sector. Surprisingly, there exists a notable gap in the existing literature concerning the factors influencing the adoption of information and communication technologies (ICT) specifically in the context of restaurants [14].

Furthermore, the research conducted in [15] found that online ordering approaches are more suitable for quick-service restaurants, whereas mobile ordering methods are better suited for full-service restaurants. The correlation between the ordering method and internal reactions, such as satisfaction and behavioral intention, was found to be strongly mediated by both positive and negative emotions, such as comfort and displeasure. Notably, only one negative emotion, anger, significantly moderated the association between ordering techniques and the order amount.

Finally, the trend of using AR technology in the food sector has been growing in recent years, with various reports from food-related companies, publishers, and software makers highlighting its potential. Forbes, for instance, explored the potential of using AR in the food industry, specifically in food production and safety, in a report mentioned in [16]. Another company, Zealar, has investigated the potential uses of AR in various aspects of the

restaurant experience, including menu display, food inventory management, and providing customers with nutritional information about a dish [17]. Furthermore, the COVID-19 pandemic has accelerated the adoption of AR in the food industry, with restaurants and food-related businesses leveraging the technology to offer contactless experiences to their customers.

3. The Definition of Digital Restaurants

A digital restaurant, also known as a virtual or ghost restaurant, operates solely through delivery orders placed over the phone or online. Additionally, most of these restaurants do not have a physical storefront, only a kitchen, which allows them to save on rent costs and staffing. This is different from a “ghost kitchen”, which is a shared meal preparation concept without a retail presence that can be purchased by a restaurant or multiple restaurants.

In response to the pandemic, the restaurant and food industry has incorporated many interactive features, moving away from traditional menus. According to [18], 81% of customers have placed an online order through the store's website, while 43% have used a mobile application for ordering. Digital menus offer numerous benefits, including the use of digital displays, such as computer monitors or touch screens, which allow customers to browse and select food while providing visual aids such as images and descriptions [19][20]. Digital menus also provide a lot of information that can be easily updated and customized, making cross-selling opportunities more accessible, such as suggesting drink pairings with dishes [21].

However, despite the advancements in digital menus and the incorporation of new marketing techniques and digital marketing methods, there is a scarcity of research findings regarding the impact of mixed marketing strategies on restaurant business competitiveness [22]. Understanding the effects and efficacy of these strategies in enhancing restaurant competitiveness remains an important area for further investigation.

Moreover, digital menus offer a more interactive experience through images, colors, and options, resulting in an increase in sales [23]. Another definition of digital restaurants is that they offer a full menu that is not available in their physical store. What is more, these menus exist solely on online platforms like Grubhub for delivery purposes. Virtual restaurants can also share a kitchen with another business to prepare their food or offer a different menu for takeout and in-person dining, with both menus being prepared in the same kitchen.

4. Digital Restaurants in Greece

Digital restaurants in Greece have been on the rise in recent years, with several businesses adapting to the trend. However, the country was initially slow to adopt global food delivery platforms such as Wolt or e-food, which made it difficult for some businesses to reach a wider customer base. This changed during the COVID-19 pandemic, as many businesses were forced to adapt to the new circumstances and turn to online platforms to continue operating. As a result, there has been an increase in the number of digital restaurants in Greece, with both new and established businesses offering online ordering and delivery services.

Digital menus and online ordering have become a necessity for restaurants to stay competitive in the food industry. With the rise of food delivery services and the convenience of online ordering, customers expect to be able to order food from their favorite restaurants with just a few clicks on their phones or computers. The pandemic has accelerated this trend, making digital restaurants an essential part of the food industry in Greece and around the world.

According to a survey conducted by Statista [24], the revenue generated by restaurants and mobile food service activities in Greece is projected to reach around USD 4843.46 million by 2025. This represents a significant increase from previous years and highlights the growing trend towards digital restaurants in Greece, which is expected to continue its upward trajectory until 2025.

Digital restaurants in Greece have been gaining popularity in recent years, with an upward trend that is expected to continue in the coming years. This is evident from the increasing number of online platforms that offer budget-friendly options for menus. These platforms provide restaurants with the opportunity to offer bigger offers and discounts, which can attract more customers [25]. Moreover, consumers can use online platforms to find different menus and filter their search to find exactly what they want, including high-quality dishes at affordable prices [26]. This is particularly relevant amid the pandemic, as people are increasingly relying on online food ordering due to restrictions on dining out. As a result, orders have increased considerably, and customers are more willing to try new flavors and dishes at lower prices [27]. This trend is expected to continue, as more people become comfortable with the convenience and affordability of online food ordering.

As a response to the pandemic, many restaurants created their own websites to avoid paying commissions to online platforms and to adapt to the new conditions [28]. This allowed them to enter the digital age more easily and thrive as digital restaurants. Although the pandemic was the main driver of this trend, it seems that the future of the catering industry is promising in the digital era.

5. Vegans as Restaurant Customers

The trend of vegetarianism and veganism has become increasingly popular in the food industry. In Europe, sales of vegetarian products increased by 451% between 2014 and 2018, and many fast food chains, such as McDonald's, Tyson's, and Burger King, now offer vegetarian options. This trend has also impacted the tourism sector, as ethical consumers seek out products that are environmentally friendly and do not harm animals [28].

In the United States of America, obesity remains a major health concern, particularly in regions with high poverty rates. According to a study by Crimarco et al. [29], poor eating habits and fast food consumption are the main drivers of this epidemic. However, vegetarian restaurants are emerging as a viable option to promote healthier eating habits. The study surveyed 45 vegetarian restaurants in counties with an average population of $36.5\pm18.5\%$, an average poverty rate of $15.5\pm3.85\%$, and an average obesity rate of $26.8\pm4.8\%$. Notably, over a third of the restaurants surveyed ($n=18$, 40.0%) were located in food courts. The owners of these restaurants emphasized the importance of educating customers on vegetarian and healthy

eating habits, and many of them offer cooking classes and seminars to encourage healthier food choices. It is essential for the community to engage in discussions with health professionals in collaboration with restaurant owners to promote healthier eating habits and combat the obesity epidemic.

The owners of vegetarian restaurants in the US are striving to educate their customers on vegetarianism and healthy eating, emphasizing the urgent need for people to become familiar with vegetarian food and use quality ingredients [30]. As many of these dishes do not require special cooking skills and taste great, they attract customers' attention, who can easily prepare them at home. Some restaurant owners even offer cooking classes and seminars on this type of diet to influence customers' eating habits. It is crucial for US residents to discuss healthy food choices with healthcare professionals in collaboration with restaurant owners, to promote healthy eating and discourage unhealthy eating habits. Additionally, vegetarian diets are commonly associated with better health, with many Western vegetarians adopting a healthier lifestyle to address health issues or prevent diseases.

In the study conducted by the authors in [31], the objective was to investigate whether businesses offering vegetarian options on their menus would benefit from an increase in the number of reservations and whether adding such products would enhance the quality of services offered. Understanding the impact of vegetarianism on tourism and the traveler experience is crucial in improving the products and services provided by businesses. The research findings indicated that it has become increasingly easier for vegetarians to find products not only in the European Union but also in the USA and Asia. This highlights the importance of businesses catering to the growing demand for vegetarian options in their menus, as it can lead to increased revenue and customer satisfaction.

Although vegetarianism is still practiced by a relatively small percentage (approximately 0.5%0.5%) of the population in the United States, its popularity is growing. The culinary choices of vegetarians have been extensively studied from a scientific perspective [32]. Furthermore, recent studies using CUX (a system for monitoring user behavior) have shown that visitors tend to bring their own cultural characteristics and preferences when visiting destinations of cultural interest, resulting in a unique experience. To cater to this trend, various research efforts have been undertaken to identify different cultural visitor profiles based on their backgrounds and preferences, and to categorize them into distinct visitor types.

In a study conducted by Konstantakis et al. [33], a typology was proposed to classify cultural visitors based on their visit and preferences. The objective of this proposed typology is to provide a comprehensive classification of cultural visitors. The ACUX typology was developed using a process of harmonization with existing cultural visitor typologies that classify visitors based on their preferences. The study also evaluated the proposed typology against harmonized typologies using TripAdvisor customer responses. This research highlights the importance of understanding the preferences and characteristics of cultural visitors in order to provide tailored experiences that cater to their needs.

6. COVID-19's Impact on the Restaurant Industry

During the COVID-19 lockdown, many restaurants saw a decrease in on-site reservations and foot traffic. However, in the US, UK, and Canada, takeout and delivery orders continued to grow steadily, particularly for fast food and quick meal restaurants, which offered easy and convenient options for customers. Despite the shorter distances people traveled to pick up their orders, the share of carryout versus delivery remained relatively stable. According to a study presented in [3], weekday orders accounted for almost 12% of total orders, with the highest number of orders occurring on Tuesdays. In contrast, weekend orders were fewer due to the blurring of the concept of a “weekend” during the pandemic.

The time of day is a significant factor in takeout and delivery orders during the pandemic era. According to the research conducted by [3], dinner orders decreased by around 3% compared to pre-pandemic times, while lunch orders increased by about 18%. Late-night orders experienced the biggest decrease, with an overall drop of 11%. Additionally, since people had more free time during quarantine, they had the opportunity to research and discover new restaurants to order from. According to [34], new customers tend to order 8% more and usually make more expensive orders. Most orders, about 63%, were made over the telephone and mainly on weekends, with fewer orders placed on weekdays.

Furthermore, during the pandemic, many people were encouraged to stay at home, leading to a surge in interest in home cooking. As a result, chefs and other individuals related to the restaurant industry are looking for simple and easy recipes with few ingredients to improve their skills and techniques. Mobile phones have also played a crucial role in facilitating online ordering, with approximately 40% of orders in the UK being placed through mobile phones according to food-related surveys cited in [34].

In a study regarding sustainability and recovery measures in restaurants sector after the COVID-19 pandemic [35], the authors stress the need to increase the automation pace in the sector, which includes online deliveries and functionality. QR-codes in menus and even delivery by drones are proposed, although they understand that measures such as the last one may lead to job losses. Because of the pandemic, restaurants of luxury hotels in China were forced to join delivery platforms [36]. Results from this experience showed that taste, freshness, brand credibility and interaction quality with the staff still were important factors for customers as in dine-in restaurants, in addition with packaging and delivery quality that emerged with online deliveries. New information and communication technologies (NICT) are proposed in [37] as a means for facilitating the implementation of delivery or take-away services. However, the adoption of such technologies should be integrated with care in the operation of a restaurant to avoid extra costs and employee and customer dissatisfaction. Another study on the effects of the pandemic on the hospitality industry [38] stresses the need for the integration of artificial intelligence in the restaurant sector in addition to traditional digital technologies for online menus and delivery. The automation of menu preparation, packaging, and delivery procedures with AI strengthens safety, although impact on employment and customer acceptance should be further studied.

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