HDM Model for Assessing the Readiness/ Optimization of Restaurant Delivery Systems

Moise Degand
Portland State University

Duane Murray
Portland State University

Yaya Sirimongkarakorn
Portland State University

Mohammed Thawab
Portland State University

Mohammed Zaid
Portland State University

Title: HDM Model for Assessing the Readiness / Optimization of Restaurant Delivery Systems

Moise Degand <mdegand@pdx.edu>

Duane Murray <murray27@pdx.edu>

Yaya Sirimongkarakorn <tasiya@pdx.edu>

Mohammed Thawab <mthawab@pdx.edu>

Mohammed Zaid <msz@pdx.edu>

ETM OFFICE USE ONLY	
Report No.:	
Type:	Student Project
Note:	

Abstract

This paper assesses the readiness and the optimization of restaurant delivery systems. The restaurant industry has suffered a lot economically during this past year. Several restaurants didn't survive the pandemic and others still are still struggling to remain open due to local and federal laws preventing gathering in a restaurant. To survive during this pandemic, restaurants will need to pivot and change their day to day business operations. Two surveys research were conducted based on our initial Hierarchical Decision model's category containing safety, quality, service, economics. One survey was sent to a few restaurant owners and the other was sent to the general restaurant customers A Hierarchical Decision Model (HDM) was created to identify the key factors that will enable restaurants to efficiently meet and implement delivery services to general revenues while the governmental restrictions are still in place.

Table of Contents:

Executive Summary

The United States restaurant industry is worth 800 billion dollars, with more than six hundred thousand restaurants nationwide. The restaurant industry is one of the more difficult industries to maintain profitability and longevity within. It is substantial that around sixty percent of restaurants fail within their first year of opening and smaller start-up restaurants such as family run businesses have a higher potential for failure. Moreover, the challenges associated with maintaining a restaurant is endless. Over the last ten years restaurant delivery has seen an increase in popularity; however, restaurants are not taking advantage of delivery systems. The evolution of the restaurant industry has changed from conventional dine-in towards to-go and delivery methods. Now with Covid-19 restaurants have been struggling with business due to regulations forcing indoor dining to be closed. Covid-19 has resulted in one of six restaurants to permanently close during the pandemic. The adaption to offering alternatives of dining would allow new revenue streams to sustain business; customer preferences may continue to reinforce these alternatives in the long run.

This HDM model is designed to assist restaurants in determining methods of food service that would provide the most benefits. The model identifies methods of food delivery that are compatible for both the restaurant and the customer.

A literature review was conducted to identify the gaps in the market for restaurant businesses. Literature review revealed that China's food delivery systems are much more advanced than the U.S and Covid-19 continued to increase the number of restaurants using these delivery platforms. Other countries' use of delivery services highlight the potential in the market that the U.S could take advantage of. The findings of the literature review explain the commonalities between applications' costs and values.

Brainstorming sessions resulted in the most critical, applicable criteria and sub-criteria for the HDM model. Experts evaluated the model and assigned weights relevant to importance for the criteria. The feedback established the HDM criteria as: Safety, Quality, Service, and Economics. Sub-criteria in levels 2 and 3 were also adjusted for level of importance. The final HDM model was established. Parallel to the HDM model surveys were completed by members of the community to understand the consumer preferences and demographic of food delivery.

There was a high level of accuracy from the expert panels, proven by the low inconsistency and disagreement rates. A low inconsistency rate is significant for an efficient hierarchy decision model. The model outlines economic factors to be the

highest contributing concern for restaurant delivery systems; moreover, safety was the lowest scoring contributing criteria.

Limitations to the development of the HDM model could include expert bias and incomplete transparency for answers. Further research including more diversity could eliminate inconsistency. Research conducted as the pandemic ends and restaurants begin opening for full service will produce a more comprehensive understanding of restaurants' desires to utilize delivery services

Introduction

The advent of the COVID-19 pandemic created a disruption in the restaurant industry. This disruption created a profound impact on the owners, employees, and customers of the majority of these establishments as all indoor dining was prohibited. Though food delivery is not an entirely new concept, as it has been traditionally used within the United States by pizza and chinese restaurants (Dolibog, 2020) -- this sudden economic shock caused by the pandemic made pickup and delivery services the only revenue source available to the industry; ready or not. In addition, several upcoming third party delivery services such as doordash, grubhub, or postmates were in place to help bridge the gap to those organizations that were not positioned to provide food delivery prior to the disruption. To survive, restaurant owners were forced to quickly make decisions to adapt to this new paradigm or simply shut down operations.

Initially considering that many restaurants were not already providing delivery services prior to this disruption, it became apparent that gaps exist in meeting the requirement of food orders destined to be served directly to a customers table, opposed to orders destined for delivery or pickup (Molina-Besch, 2020). Internal process changes, packaging requirements, delivery methods, and a new view on customer service issues were needed to be analyzed and addressed. These needs opened the door to develop a model to help restaurant owners to decide the best approach to take for their businesses.

Several perspectives were initially identified that influence the decision making process of a restaurant owner to adjust operations to work within a food delivery or take-out model. These perspectives are the safety regarding food and drivers, the quality of the food, the customer service provided to patrons, and the economic impacts to the business regarding revenue and costs (Appendix 1). Each of these perspectives have multiple factors to consider, such as the best type of packaging to use, the temperature

of the food when it is delivered, the profitability of delivery orders, and the menu of items provided to customers.

Considering these perspectives and underlying factors, there are only a few alternatives a restaurant owner can choose from. These alternatives are to simply shut down, provide pickup only service, create an in-house delivery service, or use a third party to deliver food to the customer. This model can be used not only as an aid to survive a pandemic, but also as a decision model to help non-delivery equipped restaurants to potentially add an additional revenue stream to their business through the implementation of a food delivery service.

Literature Review

A big part of our literature review and research on restaurant delivery systems have highlighted the need for businesses to re-strategize, re-design, and re-align their operations or business models as a form of competitive response in the global industry. The use of such third-party delivery services requires innovative technologies; typically applications and GPS technologies that have shifted the perceptions of various dining experiences, takeout experiences or overall online food ordering experiences – on top of the repercussions and effects of the COVID-19 global health pandemic.

The National Restaurant Association (NRA) has emphasized the developments and changes that they expect to occur within the food and restaurant industry by 2030 (NRA, 2019). These points are all driven by the major shifts we have seen in the online food delivery industry and trends in sharing economies. The pandemic also plays a role, with many businesses being forced to shut down or limit their operations. Demand for contactless solutions has thus grown greater with social distancing protocols and mandates being put in place in different areas.

Research has also shed light on the variation in demand that can occur throughout different geographical areas due to this. Rural, suburban, and metropolitan areas will have varying levels of demand as well as fees. For example, third-party delivery applications such as DoorDash and UberEats charge users a $2 fee for orders picked up from restaurants in the Portland metro area. This is labeled as a city mandate fee. There are many associated fees that are taken from online orders that are ordered through third-party platforms and providers. The third-party providers take a commission fee for using their platform and services. Majority of applications also charge other fees and taxes on top of orders which can include:

- Small cart fees (for orders that do not reach the minimum order requirement)
- Service fees (which helps the company operate)
- Delivery fees (which varies with different restaurants based on location and other factors)
- Regulatory response fees (that applies to local restaurants to ensure active earning couriers)
- City mandate fees (such as the Portland city mandate fee of $2)
- Membership / Subscription fees

With the number of mandates, restrictions, and closures that have been imposed by governments during the COVID-10 pandemic, many "non-essential" businesses (especially restaurants) have been limited in terms of their operations. Many of these restaurants have turned to outsourcing delivery services from third-party delivery providers in hopes of gaining additional business and staying afloat. Some have even taken a strategic approach by implementing "ghost kitchens'' which enables a restaurant to form a new identity virtually. Ghost kitchens can assist in enabling restaurants to maximize their resources and capabilities. COVID-19 has made us view these operations in a more critical way and decision makers need to consider all the possible factors to implement effective solutions that will satisfy stakeholders.

Through our literature review, we came across interesting data on Statistica (Appendix 1) pertaining to online food delivery services and systems. These statistics fueled our research by supporting us in uncovering pre-existing information on important factors to include in our initial HDM model. This data considers various aspects and perspectives from both the consumer standpoints and restaurant owner standpoints which assisted us in forming multiple criteria for the model. The four main gaps in perspectives that we found are applicable to our model include safety, quality, service, and economics.

Problem Statement

From the literature review and research that we conducted on online food delivery systems, we built our HDM model around to help assess and answer the following problem statement:

Are restaurants ready to efficiently integrate & implement delivery services?

PESTLE Perspectives

Economic, social, and environmental impacts of the online food industry are highlighted in literature (Appendix 2)(Li, Charlene, Mirosa, Miranda, & Bremer, Phil, 2020). Our research will be expanding on this model by extending it to include political, economic, social, technological, legal, and environmental factors, to reflect a PESTLE analysis.

Political

Governments have extensive regulatory frameworks for multiple aspects of the food industry including labor requirements for food workers, sanitation/cleanliness of commercial kitchens, and standards for transporting/storing produce. Furthermore, there are also antitrust laws and regulations that businesses must adhere to. Antitrust laws (in the United States) are a collection of both federal and state government laws that work to regulate the conduct and/or organization of businesses and corporations. Typically, they are intended to promote healthy competition among businesses for the benefit of consumers. Consequently, this makes the food industry a tightly and widely regulated industry. There are many complexities that come along with regulation, which more often than not, take away from the margins of businesses. With the implementation of online food delivery systems, these regulations are still applicable, with states enforcing their own local governance.

Economical

The emergence of the online food delivery industry has procured many job opportunities for numerous individuals across wide ranges of specialties. The innovation towards online food delivery systems has given opportunities to workers both inside and outside a restaurant. This includes chefs, administrative staff, couriers/delivery fleet, as well as programmers that are behind the online platforms and applications. In addition to this, other support industries have thrived during this time with increased business, such as companies that are involved in the making and distribution of food packaging. Nonetheless, With the global health pandemic restricting dine-in services, some restaurants and establishments have had to decrease the number and hours of their workers. To accommodate such mandates and increase in demand for online food delivery, companies have recruited additional workers to provide a more extensive fleet to customers. Large online food companies employ many people in the delivery sector as couriers to have sufficient delivery fleets for all their orders. For example, one of the

leading food delivery companies, UberEats employs more than 10 thousand employees (Li, Charlene, Mirosa, Miranda, & Bremer, Phil., 2020).

While online food delivery and its industry has created this abundance of new job opportunities, there have been questions raised regarding the working conditions for these couriers. There is a standardized nature to these jobs, and limited training is offered. With such high workloads, job satisfaction is often low, and these employees are at risk to potential exposures or experiences that may affect their personal safety. This has become increasingly relevant during the COVID-19 pandemic where social distancing and mask-wearing protocols are enforced, and there is greater concern with food safety or tampering. With many people going through unemployment during COVID-19 and tips being optional, couriers are more or less earning sub-par wages. Some online food delivery platforms take a portion of tips that are given through the app, while with others, 100% of the tip goes directly to the courier.

The up-and-coming online food delivery industry and the COVID-19 pandemic has had a direct impact on traditional restaurants and their industry. Many restaurants have had to make dramatic changes in their operations or re-engineer their business models in order to remain in business. Prior to the pandemic, consumers were slowly shifting towards ordering food online as opposed to dining in at the restaurants. Many businesses that did not open themselves up to these online food delivery platforms or react quickly to these changes in the market and industry experienced a decline in profits as a result. The pandemic has emphasized a greater need to utilize online food delivery applications as restaurant closures were prolonged. These online food delivery platforms can assist the restaurant in gaining exposure to new customers and obtain sales through running various promotions. Moreover, it is important to consider the fees and commission charges that are taken by online delivery platforms for orders placed through its application. Over time, this could cause a restaurant's profits to reduce. When these fees are set too high, restaurants cannot make sufficient profits. These restaurants – typically smaller restaurants, may choose to seek other online food delivery systems (in hopes of lower fees), which can be extremely challenging in markets where individual online food delivery platforms pose a virtual monopoly. Or if push comes to shove, they may choose to not utilize online food delivery platforms altogether. UberEats charges one of the highest commissions as a food delivery provider that can go up to 35% (Li, Charlene, Mirosa, Miranda, & Bremer, Phil., 2020). This has fueled public movements towards ordering and picking up orders directly from restaurants rather than online food delivery platforms in order to better support those (local) businesses.

Especially with the COVID-19 pandemic and business closures, areas where online food industries are more developed (typically metropolitan areas), restaurants have come to the realization that they can diminish their dining areas. By doing so, restaurants are able to better utilize the space in their establishments and even dedicate that space to expanding online food delivery service capabilities. This idea has essentially fueled the rise of "ghost kitchens", which can also be referred to as cloud kitchens or dark kitchens. Ghost kitchens are commercial kitchens that do not possess a real physical store front and rely on online orders as their main (or only) source of income. This trend has grown to be relatively common in countries such as the UK, USA, China and India. By not having a physical storefront, this can bring many advantages for the restaurants. Restaurants are able to reduce costs that are associated with the premises of their establishments, through decreasing reception and wait staff during the pandemic. In addition to this, these commercial kitchens can run and provide a diversity of various dine out experiences from just one kitchen. This provides a gateway for different kitchens to capitalize on the benefits of scaling and allow room for investments in streamlining delivery management. Nonetheless, regulations should still be placed on such ghost kitchens to ensure they are meeting health and safety aligned and approved by the FDA standards.

Social

The online food delivery has an impact on the relationship that exists between consumers/users and the food that they eat or consume along with the way that it is prepared. There has been criticism on how these online food delivery platforms influence the quality of interactions in the community and/or impact quality family time that is spent preparing home cooked meals. Shopping for groceries and preparing meals has been something that traditionally, families would enjoy doing together in order to spend time with one another. Convenience is a commodity and ordering online food delivery relieves the stress that may be associated with buying, cooking, or preparing meals. Placing online orders allows consumers to save time otherwise spent on shopping for groceries, cooking, or cleaning up afterwards. There may also be cultural or demographic factors such as age that also influence these habits and trends. A study in Guangzhou, China estimates that at least two hours a day could potentially be saved by ordering food online as opposed to eating out or cooking (Liu, C., Chen, J., 2019). It was also found that many individuals in this study preferred placing their orders during their commute home from work. The food would arrive around the time the consumer got home, and more time could be spent relaxing at home with their meal after a long day. This can be especially true for people in fast-paced work cultures and environments.

Population density of an area can highly impact the use of online food delivery systems. These platforms are more commonly used in metropolitan areas as well as some suburban areas where there is a larger abundance of restaurants and neighborhoods. More rural areas in which not many people populate will have limited restaurant options and availability. Typically, options would be limited to mainly fast-food restaurants and local chains.

Moreover, online food delivery and COVID-19 has greatly impacted the different social relationships between people. Platforms were adapted so that couriers did not have to come into contact or come face-to-face with consumers. While some may choose to order online because they do not have anyone to share a meal with, online food delivery can provide this service to both those who prefer to eat alone and to groups that share food and split fees without having to compromise quality, value, or taste. There is a wide range of restaurant options and menu items available through these platforms that are easily accessible to the public. These systems expand the range of the food environment by providing options on the platform that work to fit each consumer's preference and accommodate their varying lifestyles. Many categories and features are offered to include those who are more health conscious or have special dietary restrictions/allergies. From the viewpoint of public health systems, it could be said that these online food delivery platforms can influence consumers to lead a sedentary lifestyle through increasing food availability and choices. Another impact that online food delivery platforms have on a community is increased traffic or accidents. With the increased number of couriers on the road rushing to meet delivery times (and using their smartphones), this can have a negative impact on road safety. The courier's safety has been a moral concern, especially during the global health pandemic. The question has been raised as to whether or not it was appropriate for couriers to expose themselves to potential risks of infection while earning such low wages.

Technological

The online food delivery platform functions digitally, typically from a smartphone application or over the internet. There have been many technological changes and automation in the food industry that include self-checkout systems, POS systems, and online food delivery platforms. These platforms offer an online menu that users and consumers can browse. Some platforms offer the option of customizing or altering menu items to user preferences, while some do not accept special requests due for more standardization. Items can be updated by the restaurant through the system to inform customers if certain things are sold-out or unavailable. The growth of such online delivery systems has fueled technological awareness and level of innovation within the

sector to provide technological incentives through such online food delivery platforms. Programs and algorithms are used within these platforms to assign couriers to orders in their local area and logistically manage driver routes. Data generated from these platforms give insight into consumer eating habits and spending patterns. Technology is used throughout to support different research and development activities that can provide useful data for these delivery providers to improve their products and services.

Legal

Legally, there are many laws and regulations that surround online food delivery platforms and providers that have a direct impact on operations. This includes employment laws, antitrust laws, consumer protection laws, and health and safety laws. These laws and standards have been exacerbated as a result of the COVID-19 global health pandemic, as concerns of health and safety have grown.

Some states like California passed a Fair Food Delivery Act of 2020, which requires third-party delivery companies and platforms to have a stated agreement with merchants to deliver food orders from their establishments (California., Assembly Bill No. 2149). This was influenced by many small businesses speaking out about the negative effects it posed. Reputations of these businesses were being put at stake due to third party delivery providers placing their business and menus onto their platforms – without the restaurant's knowledge and/or authority. This had many repercussions including inaccurate prices, menu items, and orders that came from posting menus that were sometimes out-of-date.

Environmental

Environmental factors to consider with restaurants and online delivery systems are those surrounding weather/climate, environmental policies, food waste, packaging, and the push towards sustainability. The online food delivery industry generates a massive carbon footprint in the environment with the great amount of waste it puts out. This can extend to both food waste and plastic packaging waste of the outputs. During the COVID-19 pandemic, many people relied on online food delivery systems, and single-use disposable food packaging usage increased as consumers viewed this kind of packaging as safer and/or more hygenic. It is important to consider the country (or area)'s recycling infrastructure when looking at the growing increase of online food delivery services. While the incentive to use environmentally friendly/biodegradable is clearly there, it can be costly for restaurants to switch over to eco-friendly packaging.

Although this adds value for customers and the environment, businesses may be reluctant to prioritize it as it does not contribute to their food quality. Features are offered on these online platforms to allow consumers the option of requesting disposable cutlery when needed, rather than including them with every order. Since the majority of customers are dining at/from home, this removes the need for additional plastic waste since customers can use their own utensils at home.

Food waste on the other hand is normally derived from the minimum price requirement that these online food delivery companies set for customers to receive free delivery on orders. By setting that incentive, consumers can end up ordering more food than intended or needed. It is also worth noting that it is easier for consumers to make better assumptions on portion sizes and tastes when they're at the establishment or familiar with the establishment's menu. This can result in additional discarding of uneaten food if consumers do not choose to keep leftover food. There can be a hefty amount of waste generated from online food delivery ordering that has harmful implications to the environment and community.

Methodology and Process

We've started this project by conducting literature review, by researching the delivery options that are currently in the market and how they are connecting the restaurants to the end users. It was found that UberEATS and DoorDash are the mostly commonly used delivery system. Then we've identified the different categories, factors, and decision alternatives which helped us build the initial HDM.

Part of building our HDM, we created two surveys. One the survey was sent to restaurant owners and the other to the general consumers. Our restaurant owners survey consists of 34 questions and results, subdivided in 4 sections (Appendix 3 &4). The four sections were based on safety, customer service, economics and technology. Some of the safety factors were tamper-proof packaging, kitchen food handling, ingredient labels, food safety training, driver safety training. The restaurant owners were asked about customer feedback regarding quality of their products, and time of food delivery services. For better understanding of restaurants' readiness to support online services, some of the survey questions focused on current technology such as POS systems and their readiness on website optimizations. Economically, there were questions about revenue comparison between sales that were recorded before and during the pandemic. Also, there were questions associated with the cost of doing business by utilizing a third-party delivery service.

Few results were generated from the Hierarchical Decision Model that was created with the different categories, sub-factors and the decision alternative that were evaluated. They were each given a score and economics score the highest in from the perspective side. As we've expected, generating revenue was the driving force behind the restructuring of business operations. Customer satisfaction scored the highest amongst the different factors. Now, more than ever restaurant owners must find ways to remain competitive to survive this pandemic whether through promotions, discounts, or creating tangible added values for consumers. Lastly, in house delivery scores the highest in the decision alternative category due to the fees that companies are occurring using third-party delivery systems. These results are explained in greater details in the result section.

Results and Analysis

Model Development

Figure 1 below shows the HDM finalized by the expert panel after receiving the pairwise comparison results from each expert on every node of the HDM. After the data collection, the relative contribution of each element of the decision model was calculated. The contribution values obtained from the quantified judgments of the experts are shown below each perspective and each factor. The highest score in every category is highlighted in **Figure 1**. Based on the experts, the economics perspective scored highest at 0.31. The economics perspective aligns well with the literature to be a crucial contributing factor to the restaurant's delivery systems. Moreover, the highest factor under economics is the "restaurant break-even analysis", thus, it's clear that if the delivery systems won't make sense financially, then no need to pursue further with any delivery initiative. Furthermore, quality scored the second highest perspective in importance at 0.27, and the highest factor in this category is the "customers satisfaction", to treat it as the most important indicator of quality. Next is the service perspective scoring 0.24
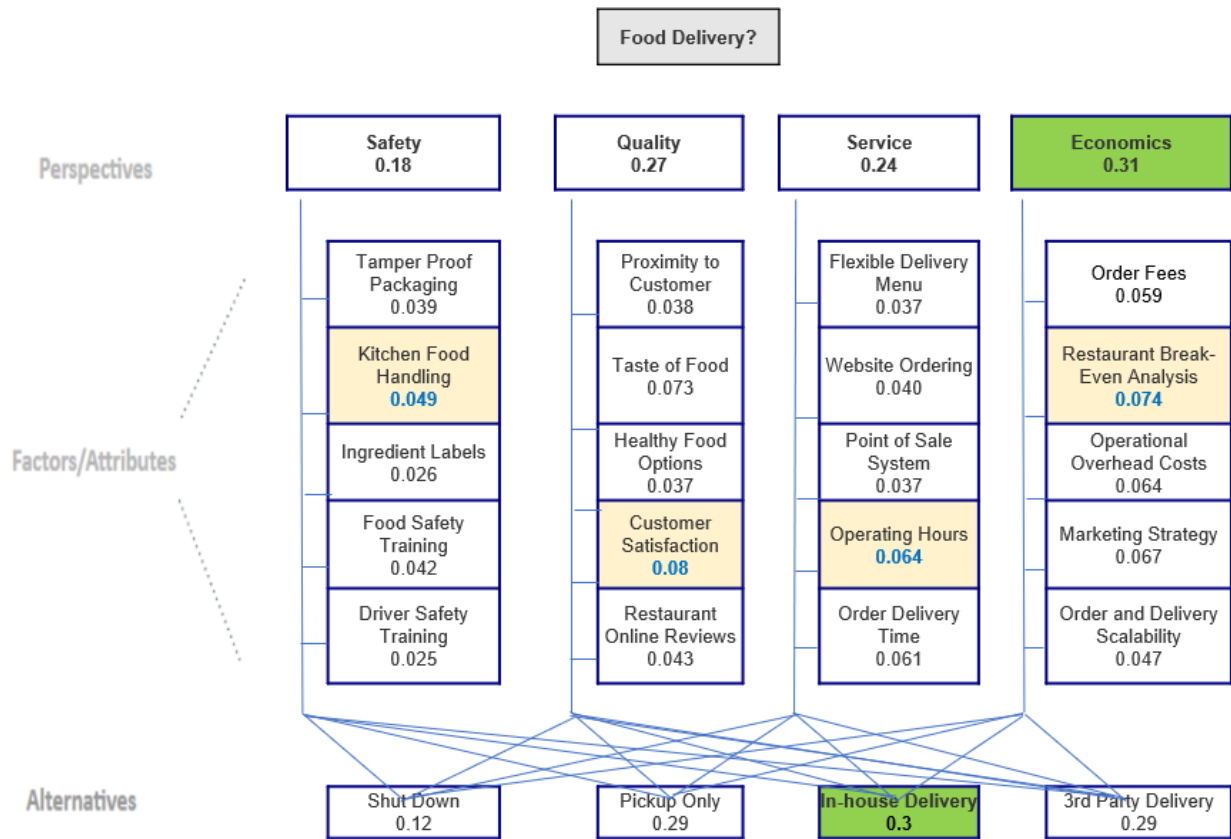
Figure 1 - Final HDM

with the highest factor to be the "operating hours". Finally, the Safety perspective scored the least at 0.18.

It's important to note that all the highest factors under each perspective share one thing in common: the "economic component". To illustrate, operating hours (highest score factor) under service perspective is directly linked to economics, such that, longer operating hours are only possible if there is budget for that purpose. Similarly, customer satisfaction is to be granted if there are high-end packages preserving the heat, and so on. Finally, safety in kitchen food handling will be enabled if right training measures, monitoring systems are established to assure that, which is again directly related to economics. Thus, whichever alternative is chosen needs to properly address the economic perspective.

Finally, the alternatives were scored as well by the experts, and the results in **Figure 1** shows that three of the alternatives have very close values; in-house delivery scoring highest at 0.3 , and follow that is pickup only alternative along with 3rd party

delivery alternative with same score at 0.29. Then comes the shutdown alternative at 0.12. Therefore, it's very clear that shutdown isn't an option, and pursuing the three alternatives simultaneously is a convenient path forward.

HDM Analysis & Assessment

Table 1 shows the inconsistency level of each of the experts scoring the final node (alternatives). The inconsistency level of the experts is highly acceptable. The experts have a level of inconsistency that falls below 0.04, indicating that the relative priorities of the experts are reliable, additionally, the disagreement between all experts is very low at 0.051. Moreover, to test the group agreement, the F-test computed from this sample of population (5 experts) is 6.26, and F-critical at the 0.01 level is 5.95. Since the computed F-value is larger than F-critical, we can say that there is no statistically significant difference among experts in the expert panel regarding alternatives. However, it's important to note that the F-critical and F-computed are close in values, thus, to make a qualitative decision, more experts need to score the model, and the population for F-test distribution needs to be more than 5 experts. Thus, assessing the HDM further by more experts can help make the model more robust and accurate.

Conclusion, Limitations, and Future Research

In conclusion, limitations and areas for future research exist within this study and are enumerated below:

1. The time limits imposed on completing this study was short (10 weeks) which did not allow ample time for a full and complete decision model to be created for this subject area. With more time a more accurate model could be presented.
2. The sample sizes used in our surveys were small which limits the reliability of significant relationships within the data. Using a larger sample size should provide more accurate results.
3. Similar to our survey sample sizes, our pairwise comparison expert panels were also limited in size. A larger group of focused expert panels should increase the decision models accuracy.
4. Desirability curves need to be created to fully complete the model.
5. The final hierarchical decision model needs to be applied to specific restaurant case studies.

6. Once the pandemic has ended and dining has returned to its prior state, it is unclear how critical the food delivery model will be in society. It may continue as it has or it may drop in significance.
7. This model could be used by a restaurant (post-pandemic) as an aid to determine if adding a food delivery service option for their customers would create a new profitable revenue stream for the business.
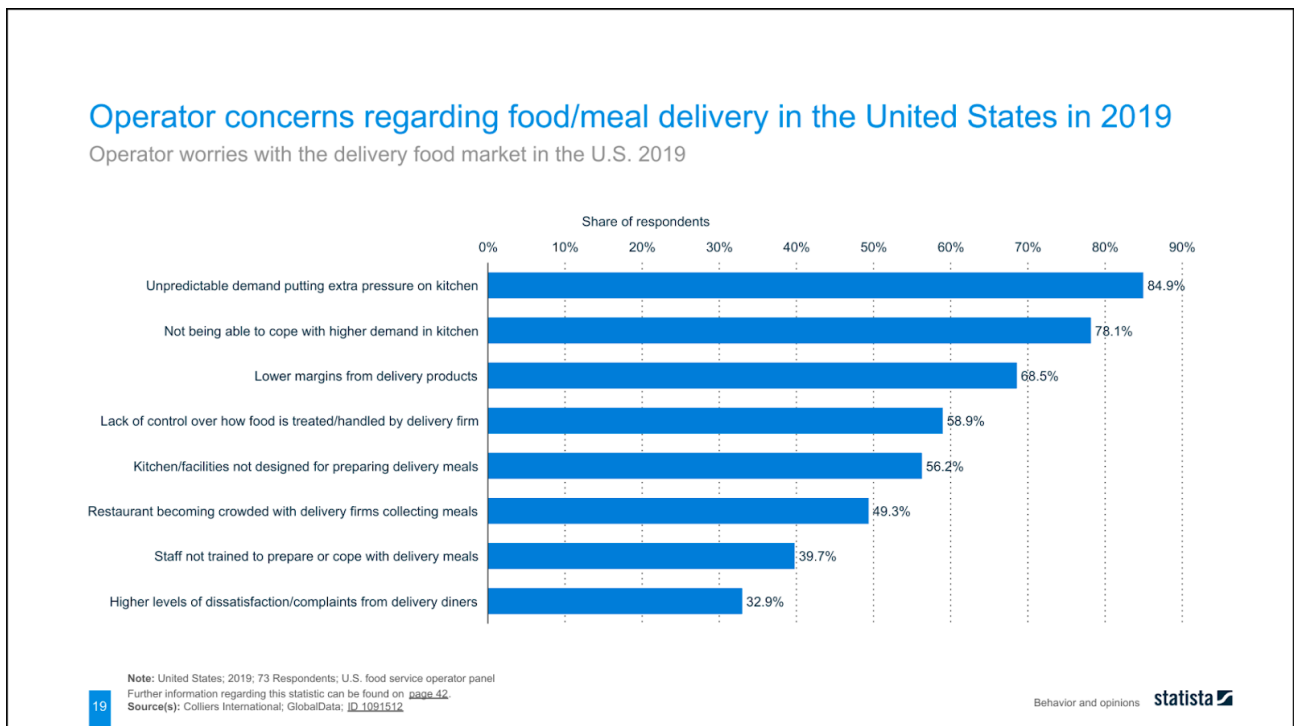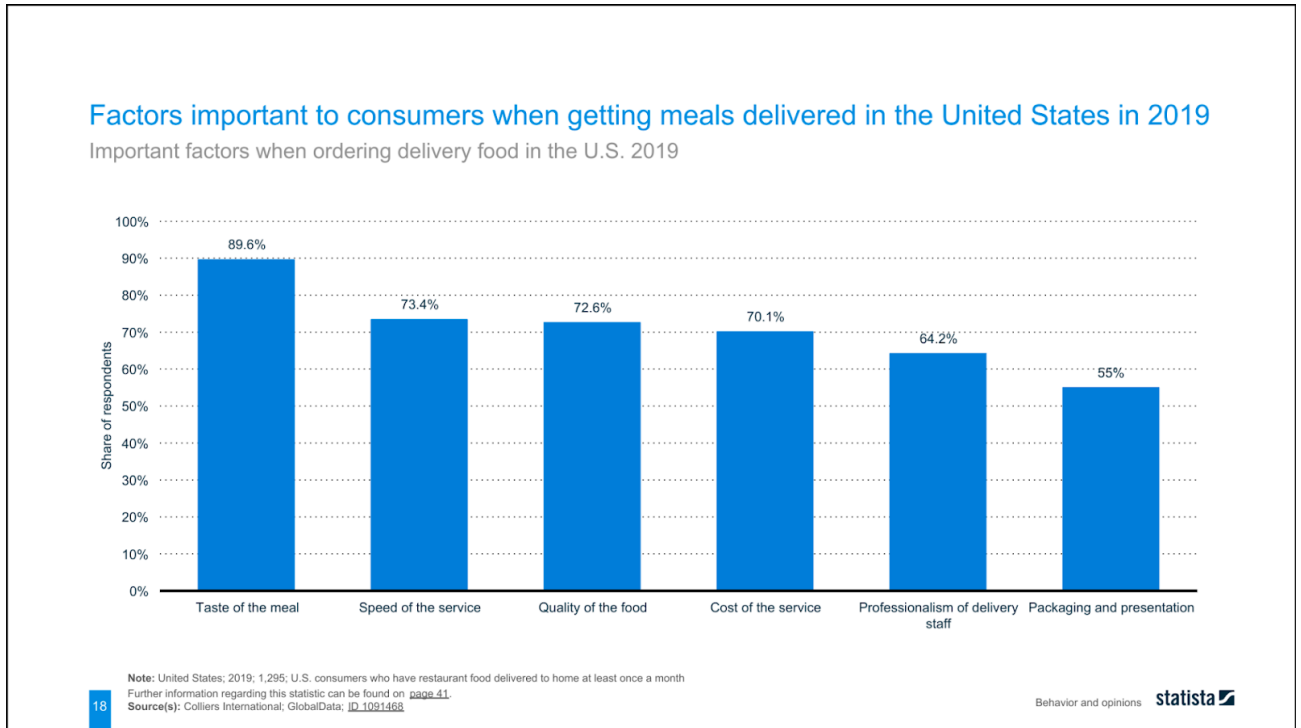
Bibliography

1. California., Assembly Bill No. 2149. (2020, September 24). Retrieved March 15, 2021, from https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB 2149#:~:text=This%20bill%20would%20enact%20the%20Fair%20Food%20Delive ry,and%20deliver%20meals%20prepared%20by%20the%20food%20facility.

2. Clapp, Jenifer, Calvo-Friedman, Alessandra, Cameron, Susan, Kramer, Natalie, Kumar, Samantha Lily, Foote, Emily, Lupi, Jenna, Osuntuyi, Opeyemi, & Chokshi, Dave A. (2020). The COVID-19 Shadow Pandemic: Meeting Social Needs For A City In Lockdown. Health Affairs (Project Hope), 39(9), 1592–1596A. https://doi.org/10.1377/hlthaff.2020.00928

3. "Consumers are expected to continue using takeout and delivery," *National Restaurant Association*. [Online]. Available: https://restaurant.org/articles/news/consumers-to-continue-using-takeout-and-delivery. [Accessed: 15-Mar-2021].

4. Daily: Catering Association and Public Media should not Moral Kidnapping Platforms to Lower the Commission. Available online: https://archive.is/kmZMj (accessed on 18 Feb 2021).

5. Dolibog, A. E. (2020). *A case on food delivery transformation in Lisbon and Berlin: the effect of digital adoption on consumer online purchasing behavior* (Doctoral dissertation).

6. Food Safety Supervision and Management Measures for Online Catering Services. Available online: https://archive.is/YhTs4 (accessed on 14 Feb 2021).

7. Hadi Mohamad, Abdul, Athirah Hamzah, Anis, Ramli, Ramona, & Fathullah, M. (2020). E-Commerce Beyond the Pandemic Coronavirus: Click and Collect Food Ordering. IOP Conference Series. Materials Science and Engineering, 864, 12049. https://doi.org/10.1088/1757-899X/864/1/012049

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

9. How Food Delivery Apps Have Changed the Game for Restaurants. Available online: https://archive.is/nzjpJ (accessed on 14 Feb 2021).

10. J. Kim, J. Kim, S. K. Lee, and L. (R. Tang, "Effects of epidemic disease outbreaks on financial performance of restaurants: Event study method approach," *Journal of Hospitality and Tourism Management*, 13-Feb-2020. [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1447677019303535?casa_to

ken=ApLjqAjFE1oAAAAA%3AfpNa0xGSnjrJp7yqB_FSafNhGIXXQerTZsa_ohkeBok_
f34f4L_5H-nVDtQpqPql6zuk_o_duw. [Accessed: 15-Mar-2021].

11. Ketchen, David J, & Craighead, Christopher W. (2020). Research at the Intersection of Entrepreneurship, Supply Chain Management, and Strategic Management: Opportunities Highlighted by COVID-19. Journal of Management, 46(8), 1330–1341. https://doi.org/10.1177/0149206320945028

12. Khan, M. A. (2020). Technological Disruptions in Restaurant Services: Impact of Innovations and Delivery Services. Journal of Hospitality & Tourism Research (Washington, D.C.), 44(5), 715–732. https://doi.org/10.1177/1096348020908636

13. L. Dishman, "Effects of Coronavirus Pandemic on Food Delivery Businesses," *https://www.uschamber.com/co*, 30-Mar-2020. [Online]. Available: https://www.uschamber.com/co/good-company/launch-pad/coronavirus-pande mic-food-delivery-businesses. [Accessed: 15-Mar-2021].

14. Li, Charlene, Mirosa, Miranda, & Bremer, Phil. (2020). Review of Online Food Delivery Platforms and their Impacts on Sustainability. Sustainability (Basel, Switzerland), 12(14), 5528.

15. Liu, C.; Chen, J. (2019). Consuming takeaway food: Convenience, waste and Chinese young people's urban lifestyle. *J. Consume. Cult.*

16. Molina-Besch, K. (2020). Food delivery packaging and tableware waste. *Nature Food*, *1*(9), 531-532.

17. National Restaurant Association (NRA). (2019, November 05). NRA predicts definition of restaurant will change AS Off-prem biz grows. Retrieved March 15, 2021, from https://hospitalitytech.com/nra-predicts-definition-restaurant-will-change-prem-biz-grows

18. Nita, C. Strategic analysis of cloud kitchen—A case study. Manag. Today 2019, 9, 184–190.

19. Online Food Delivery, "Hot Topic" Hidden in the Phone. Available online: https://archive.is/Mqy7Y (accessed on 14 Feb 2021)

20. "Restaurant Industry Has Already Lost $120 Billion," *QSR magazine*. [Online]. Available: https://www.qsrmagazine.com/fast-food/restaurant-industry-has-already-lost-12 0-billion. [Accessed: 15-Mar-2021].

21. "Restaurant Revolution: How The Industry Is Fighting To Stay Alive," *Forbes*, 10-Aug-2020. [Online]. Available: https://www.forbes.com/sites/hbsworkingknowledge/2020/08/10/restaurant-re volution-how-the-industry-is-fighting-to-stay-alive/?sh=6c365e38f1eb. [Accessed: 15-Mar-2021].

22. Roh, M.; Park, K. Adoption of O2O food delivery services in South Korea: The moderating role of moral obligation in meal preparation. Int. J. Inf. Manag. 2019, 47, 262–273.

23. Steever, Zachary, Karwan, Mark, & Murray, Chase. (2019). Dynamic courier routing for a food delivery service. Computers & Operations Research, 107, 173–188. https://doi.org/10.1016/j.cor.2019.03.008

24. UberEats to Change 'Unfair' Contracts with Restaurants after ACCC Investigation. Available online: https://archive.is/HMtgR (accessed on 22 Feb 2021).

25. Uber Founder Buys More than 100 "Dark Kitchens" across London in New Venture that Allows Takeaway-Only Businesses to Rent Them for £2,500 a Month to Sell

26. Uber Eats's Competitors, Revenue, Number of Employees, Funding and Acquisitions. Available online: https://archive.is/iP8Ss (accessed on 14 Feb 2021).

Appendix

1) Statistica

Factors important to consumers when getting meals delivered in the United States in 2019

Important factors when ordering delivery food in the U.S. 2019

Taste of the meal: 89.6%
Speed of the service: 73.4%
Quality of the food: 72.6%
Cost of the service: 70.1%
Professionalism of delivery staff: 64.2%
Packaging and presentation: 55%

Note: United States; 2019; 1,295; U.S. consumers who have restaurant food delivered to home at least once a month
Further information regarding this statistic can be found on page 41.
Source(s): Colliers International; GlobalData; ID 1091468

Behavior and opinions   statista

Operator concerns regarding food/meal delivery in the United States in 2019

Operator worries with the delivery food market in the U.S. 2019

Unpredictable demand putting extra pressure on kitchen: 84.9%
Not being able to cope with higher demand in kitchen: 78.1%
Lower margins from delivery products: 68.5%
Lack of control over how food is treated/handled by delivery firm: 58.9%
Kitchen/facilities not designed for preparing delivery meals: 56.2%
Restaurant becoming crowded with delivery firms collecting meals: 49.3%
Staff not trained to prepare or cope with delivery meals: 39.7%
Higher levels of dissatisfaction/complaints from delivery diners: 32.9%

Note: United States; 2019; 73 Respondents; U.S. food service operator panel
Further information regarding this statistic can be found on page 42.
Source(s): Colliers International; GlobalData; ID 1091512

Behavior and opinions   statista

2) Impacts of Online Food Delivery

The impacts of online FD was organized according to the three pillars of the sustainability framework (Figure 3) and discussed in Sections 4.1–4.3.
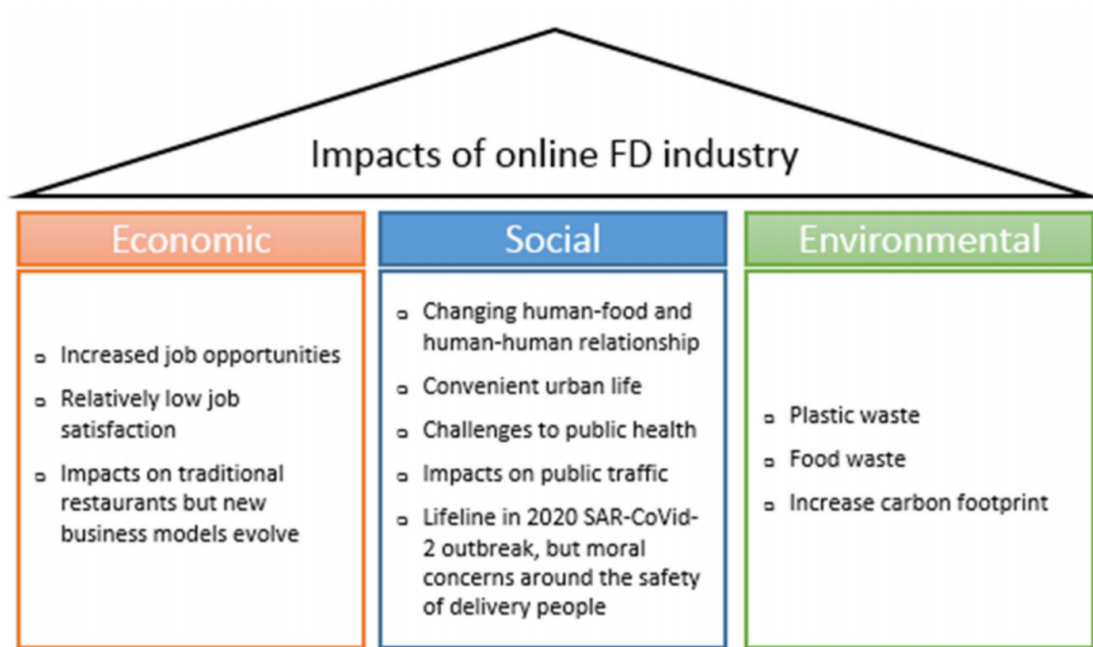
3) Restaurant Owner Survey
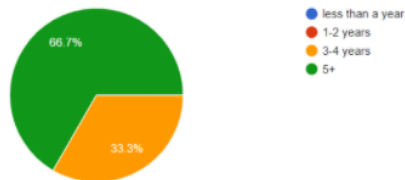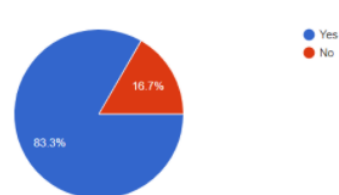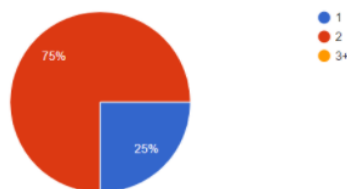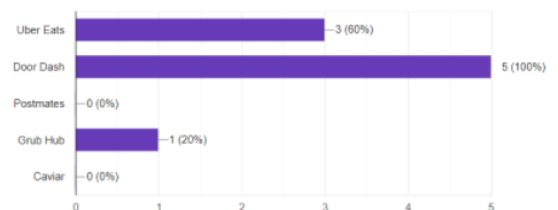
What was your average revenue per month before COVID-19?

5 responses

- < $20,000
- $20,000-$40,000
- $40,000-$60,000
- $60,000-$80,000
- $80,000-$100,000
- > $100,000
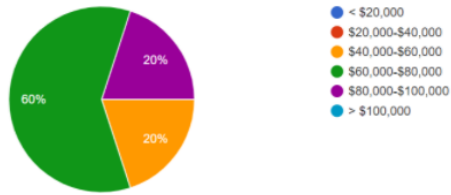
What is your average revenue per month during COVID-19?

5 responses

- < $20,000
- $20,000-$40,000
- $40,000-$60,000
- $60,000-$80,000
- $80,000-$100,000
- > $100,000
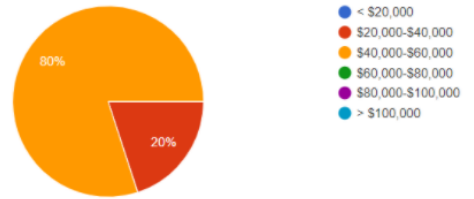
How much commission does the online delivery service retain from orders placed on the platform?

5 responses

- None
- 0-10%
- 10-20%
- 20-30%
- 30-40%
- 40+%
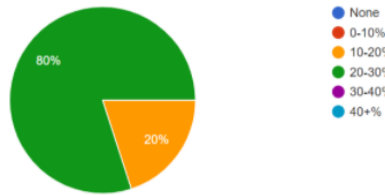
What is your restaurant's average rating on these online delivery platforms?

5 responses
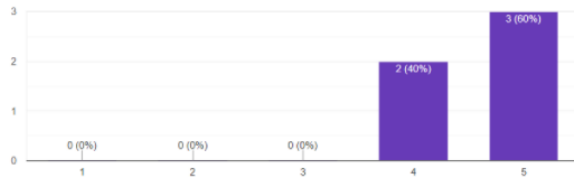
What type of packaging do you use?

6 responses
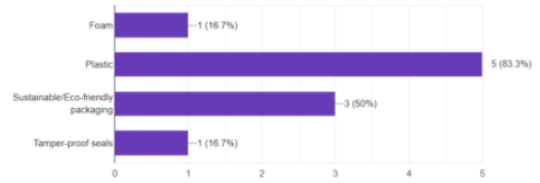
Has all your staff been certified in proper food handling and food safety?

6 responses

- Yes
- No

Have you considered additional staff training for packing food for delivery services?

6 responses

- Yes
- No
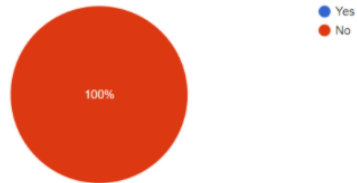
Do you list and label all the ingredients for your menu items?
6 responses

- Yes
- No

33.3%
66.7%
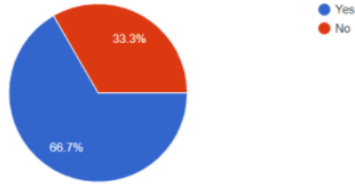
Where is your restaurant located?
6 responses

- Portland
- Beaverton
- Hillsboro
- Sherwood
- Tigard
- Tualatin
- Lake Oswego
- West Linn

50%
50%

1/3 ▼
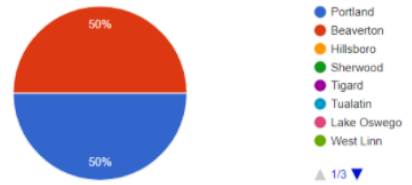
What kind of area is your restaurant located in?
6 responses

- City/Metropolitan area
- Suburban area
- Rural area

50%
50%
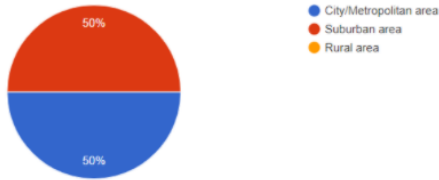
What is the most common positive feedback you have received from delivery customers
6 responses

Food quality (taste, temperature)	5 (83.3%)
Fast Delivery	1 (16.7%)
Good customer service	3 (50%)
Sustainable packaging	3 (50%)
Value for money, portion size	5 (83.3%)

0 1 2 3 4 5
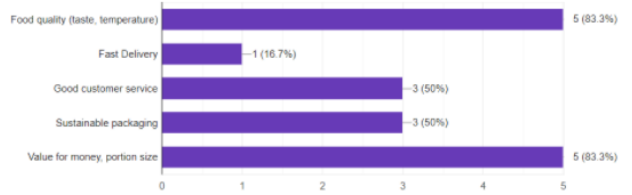
Do you get many special diet requests or custom requests?
6 responses

- Yes
- No

16.7%
83.3%
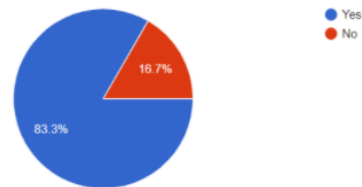
Do you offer items or options for those with special diets on your menu? (vegetarian/vegan, gluten-free, keto, halal, etc.)
6 responses

- Yes
- No
- upon request

16.7%
83.3%
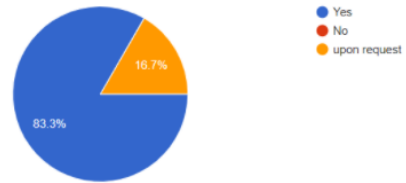
Would you say that your online ratings accurately reflects your restaurant?
6 responses

- Yes
- No

100%

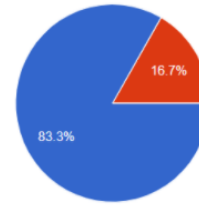## Do you offer a separate delivery menu?
6 responses

- Yes
- No

66.7%
33.3%
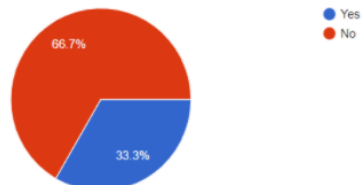
Do you have a website?

6 responses

- ● Yes
- ● No

100%

Do you utilize a POS system?

6 responses

- ● Yes
- ● No

83.3% 16.7%

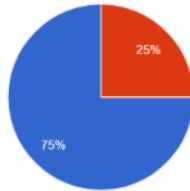**Do you have the capabilities to implement an online delivery system?**

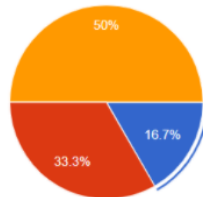4 responses

- ● Yes
- ● No

75% 25%

When are you open for service?

6 responses

Breakfast — 1 (16.7%)
Lunch — 6 (100%)
Dinner — 6 (100%)

0 1 2 3 4 5 6
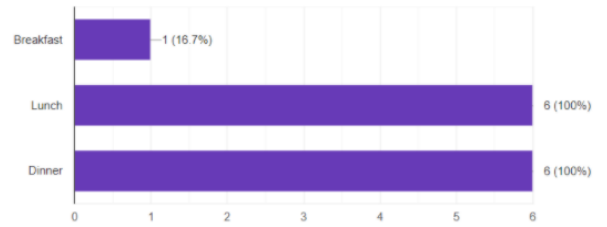
What is the average wait time for an order?

6 responses

- ● < 10 minutes
- ● 10-20 minutes
- ● 20-30 minutes
- ● 30-40 minutes
- ● > 40 minutes

50% 16.7% 33.3%
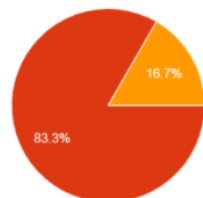
What is your profit margin with online food orders?

6 responses
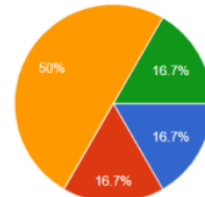
- ● 0%
- ● <10%
- ● 11% - 20%
- ● 21% - 30%
- ● 31% - 100%

50% 16.7% 16.7% 16.7%

Have you changed your staff levels since COVID-19?

6 responses

- ● Increase
- ● Decrease
- ● Stayed the same

16.7% 83.3%

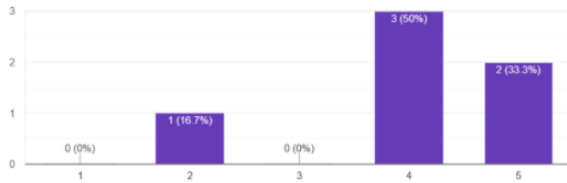**Do you have a marketing budget?**

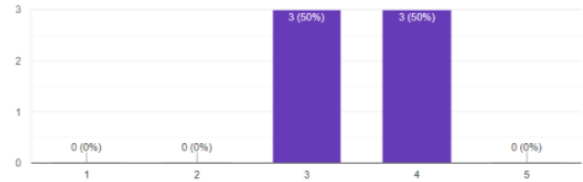2 responses

- ● Yes
- ● No

100%

How would you rate your experience using online delivery platforms?
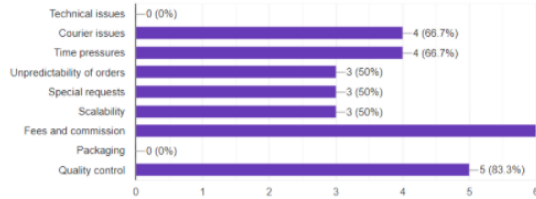
6 responses

How has your productivity changed since implementing delivery services?
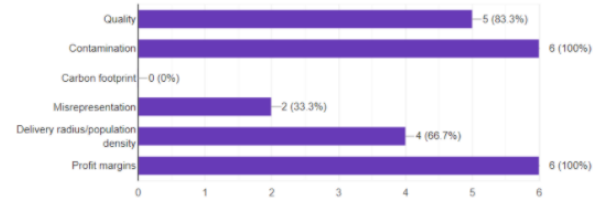
6 responses

What are some of the struggles you face with using these tools and platforms?

6 responses

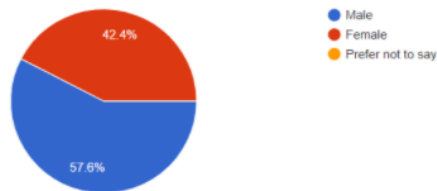What are your biggest concerns with using these tools and platforms?
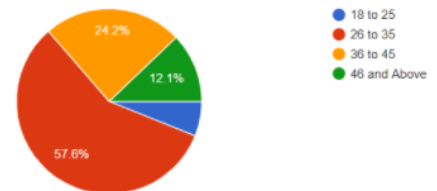
6 responses

4) Customer Survey

1. What is your gender?

33 responses

- Male
- Female
- Prefer not to say

2. What is your age group?

33 responses

- 18 to 25
- 26 to 35
- 36 to 45
- 46 and Above

3. How frequently do you order food online?

33 responses

- Once or twice a week
- More than twice a week
- Almost everyday
- Never
- Twice
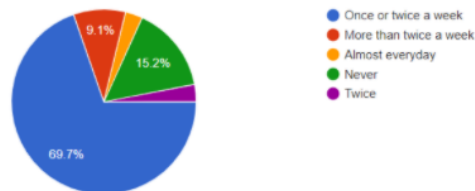
Where do you live / normally get food delivered?

32 responses

- Portland (metro)
- Beaverton
- Hillsboro
- Sherwood
- Tigard
- Tualatin
- Lake Oswego
- West Linn

1/3
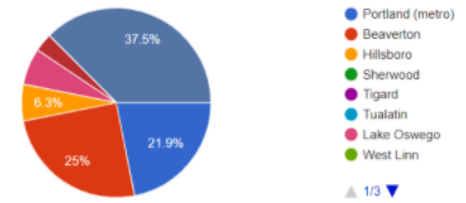
5. Which online ordering provider do you use?

31 responses

Provider	Count
Uber Eats	13 (41.9%)
Grubhub	8 (25.8%)
DoorDash	15 (48.4%)
Postmates	6 (19.4%)
Caviar	0 (0%)
Swiggy, Zomato (in India)	1 (3.2%)
Self pickup	1 (3.2%)
Swiggy, Zomato	1 (3.2%)
Online	1 (3.2%)
grab	1 (3.2%)
Resturants itself	1 (3.2%)
	1 (3.2%)
Getir, Yemeksepeti	1 (3.2%)
Directly with restaurant	1 (3.2%)
Papa johns	1 (3.2%)
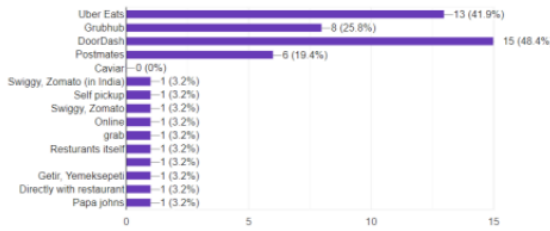
6. Which do you prefer?

31 responses

- Ordering for delivery — 58.1%
- Ordering for pick-up — 41.9%
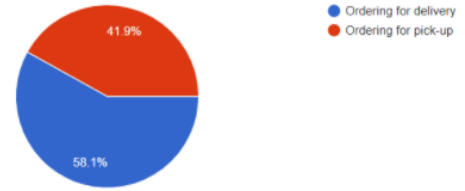
7. What kind of food do you typically get delivered?

32 responses

Food	Count
Mexican food	8 (25%)
Mediterranean food	7 (21.9%)
Chinese food	19 (59.4%)
Japanese food	5 (15.6%)
American food	16 (50%)
Italian food	9 (28.1%)
Thai food	12 (37.5%)
Indian food	11 (34.4%)
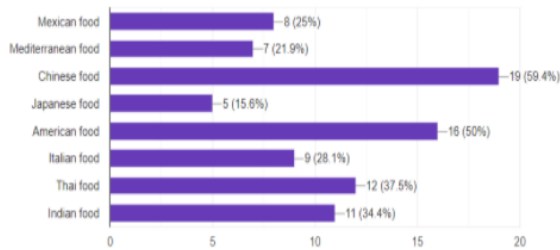
8. How would you rate your online ordering experience?

33 responses

Rating	Count
1	0 (0%)
2	0 (0%)
3	3 (9.1%)
4	21 (63.6%)
5	8 (24.2%)
Easy	1 (3%)
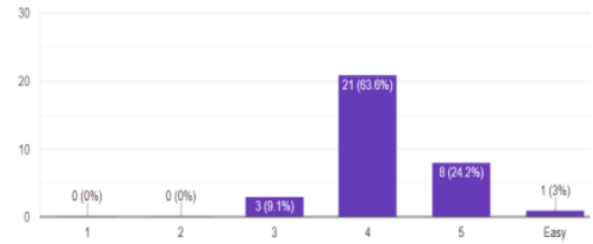
9. How satisfied are you with current online ordering platforms?

32 responses

Rating	Count
1	0 (0%)
2	3 (9.4%)
3	7 (21.9%)
4	14 (43.8%)
5	8 (25%)
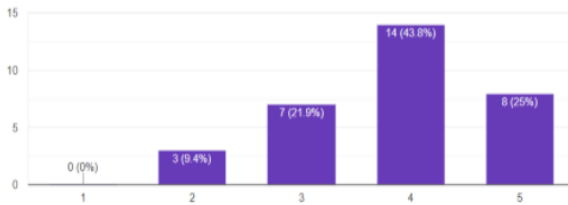
10. What influences you to order food online?

33 responses

Influence	Count
Convenience	23 (69.7%)
Price	7 (21.2%)
Quality of food	9 (27.3%)
Speed of delivery	9 (27.3%)
Reduced wait times	11 (33.3%)
Social distancing	16 (48.5%)
Contactless systems	11 (33.3%)
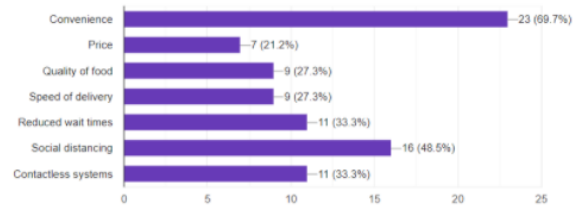
11. How much do you normally spend when ordering a meal online?

32 responses

- $10-$20 — 28.1%
- $21-$30 — 31.3%
- $31-$40 — 34.4%
- > $40
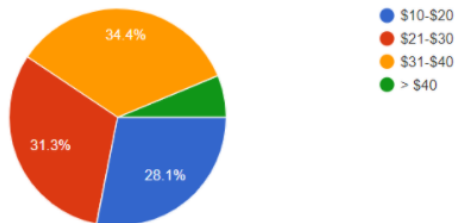
5) Tables

Food Delivery?	Shut Down	Pickup Only	In-house Delivery	3rd Party Delivery	Inconsistency
Duane Murray	0.11	0.29	0.3	0.3	0.04
Mohammed Thawab	0.18	0.22	0.27	0.33	0
Mohammed Zaid	0.17	0.31	0.25	0.27	0.02
Moise Degand	0.03	0.26	0.46	0.25	0.03
YAYA S.	0.12	0.37	0.2	0.31	0.01
Mean	0.12	0.29	0.3	0.29	
Minimum	0.03	0.22	0.2	0.25	
Maximum	0.18	0.37	0.46	0.33	
Std. Deviation	0.05	0.05	0.09	0.03	
Disagreement					0.051

Table 1 - HDM experts results