Can Website Design Save Restaurants from a Pandemic?

by
Xingqi Yan

A THESIS

submitted to

Oregon State University

Honors College

in partial fulfillment of
the requirements for the
degree of

Honors Baccalaureate of Science in Finance
(Honors Scholar)

Honors Baccalaureate of Science in Business Information System
(Honors Scholar)

Presented February 26, 2021
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AN ABSTRACT OF THE THESIS OF

Xingqi Yan for the degree of <u>Honors Baccalaureate of Science in Finance</u> and <u>Honors Baccalaureate of Science in Business Information System</u> presented in February 26, 2021. Title: <u>Can Website Design Save Restaurants from a Pandemic?</u>

Abstract approved: _____

Xiaohui Chang

Under the influence of Covid-19, restaurants in Corvallis, OR have changed significantly. Different restaurants have their unique charm to ensure that demand from consumers is met and improved concurrently. How will the website design of each restaurant and other factors affect their ratings? Will these changes impact the current operation status of the restaurant? This paper collected information on 82 local Corvallis restaurants, which can be sorted by two rating categories: the website design rating and the restaurant's star rating. The study utilizes Corvallis and acquires a thorough insight into the various background factors that determine the existence of a restaurant's success. Creating a more conducive environment for sales has always been important in any business setup but with the current pandemic, more measures are expected to be employed to ensure the safety of staff and consumers.

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Honors Baccalaureate of Science in Finance and Honors Baccalaureate of Science in Business Information System project of Xingqi Yan presented on February 26, 2021.

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I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

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Xingqi Yan, Author

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I profoundly appreciate my mentor, Professor Chang, for her help and advice throughout the development and writing of this thesis. She has been very instrumental in my understanding of business analytics and learning how to apply analytical tools in many business applications. This helped me overcome the numerous challenges that come with studying statistics on a larger scale which involves significant research in different fields of study. Also, I sincerely thank my committee members for their commitment in terms of sparing time for advice and ensuring they provide a listening ear. Lastly, I want to appreciate the effort of my family and friends and their undivided love and support in the four years leading up to my graduation.

Contents

1 Introduction

Due to the shock of COVID-19, many companies and shops face a risk of bankruptcy, while some have even closed down. Under this kind of crisis, development is critical. This study aims to determine whether local businesses attach importance to website visualization and whether they intend to improve website visualization. In this era of fierce competition and numerous customers, online consumers are the primary stakeholders. The visualization of a website is a type of marketing strategy which can attract potential customers. In Corvallis, there are about 82 local restaurants. For each restaurant, from the website visualization evaluation and interviews with businesses and consumers, we can see that the website visualization needs to be improved.

There has always been the notion that different cultures have specific eating habits and consume a diverse range of dishes. Globalization has created different alternatives to the normal way of living. Economic development also means that the traditional way of living will soon be extinct due to the demands of a modern world. The general public is spending less time and eating fewer meals at home on weekdays. This fast-paced lifestyle has led to a significant rise in the popularity of the restaurant business which offers alternative services in the form of food distribution at a cost. Although restaurants used to prefer physical operations due to the bonding and homely feeling while eating at the stores, the pandemic is quickly changing how consumers relate with food suppliers or restaurants. Website design for restaurants has been touted as a new area of possible growth in a world where technology is providing alternatives to more traditional methods of sales. Global trade has created more need for essential services, and people are ordering online at increasing rates. Website design has been adapted by restaurants to expand their scope of operation with very limited costs, providing increased income and higher returns on investments.

2 Research Questions

In this study, we are interested in addressing the following five sets of research questions:

> *Do better website designs improve restaurant ratings?*
> *Does restaurant hygiene and cleanliness help with ratings?*
> *What is the relationship between the restaurant's hygiene and its price?*
> *Which types of restaurants have better hygiene and cleanliness?*
> *What are the differences between chain restaurants and local restaurants?*

Research Question 1: Do better website designs improve restaurant ratings?

Website design is a new trend in restaurant operations and ratings, and if a business website looks unappealing or outdated, the audience may immediately have a negative impression of the business. A professional website communicates trust to the audience. Therefore, when the restaurant's website does well, it shows that the restaurant attaches great importance to its business, as well as draws an essential connection between its website score and web design.

Research Question 2: Does restaurant hygiene and cleanliness help with ratings?

Cleanliness and hygiene are the most critical aspects of the restaurant's business. No matter how delicious the food is, how creative the dishes are, and how excellent the service is, the business will not prosper if the environment is not clean. This is particularly important during a pandemic when customers are getting more concerned with hygiene and cleanliness. Therefore, I want to understand whether there is a relationship between these factors and restaurant rating through my analysis investigation.

Research Question 3: What is the relationship between the restaurant's hygiene and its price?

We often think that the higher the price, the better the restaurant, and the safer the food. Fast food restaurants have much more bacteria than fancy restaurants. Fancy or upscale restaurants usually provide high-quality food, stellar customer service, and a memorable experience. We were curious whether they also offer more hygiene and cleanliness compared to cheaper restaurants.

Research Question 4: Which types of restaurants have better hygiene and cleanliness?

We wondered what types of restaurants have better hygiene and cleanliness and what have worse. Asian foods are greasy, so these restaurants may not do very well in terms of hygiene as Asian restaurants often pay more attention to the taste of a dish than its appearance. Italian restaurants, for example, may pay greater attention to the cleanliness of the restaurants.

Research Question 5: What are the differences between chain restaurants and local restaurants?

Chain restaurants offer some amenities which small family-run restaurants do not provide. However, meeting consumer demands has always required a strategic approach in the market. Chain restaurants always perform a feasibility study on prospective markets before entry, thus ensuring a potential consumer base. Chain restaurants pay more attention to Yelp certification because a good certificate can make it easier for customers to do business with them and give potential customers the confidence to choose them. Within Corvallis, there are many local restaurants with links to different cultures depending on ownership or style of cooking.

3 Background Information

3.1 Location of Corvallis, Oregon

Corvallis is a city in Oregon, United States of America, that sits at 235 feet above sea level. Being centrally placed in western Oregon and the county seat of Benton, Corvallis is 85 and 30 miles south of Portland and Salem respectively. Albany is to the Southwest at about 10 miles, and Springfield to the south at about 44 miles. The city was founded in 1845. To access Corvallis, one will travel midway through the Willamette Valley.

3.2 Demographics

Corvallis is a multicultural city with different ethnic groups that co-exist given a recent rise in the large population of the area. In 2018, Corvallis had an estimated population of 57,200 people who averaged 27 years of age, much younger than most parts of the country. Major ethnic groups include Whites at an estimated 76.4%,

Asians at 9.95%, Whites with Hispanic heritage at 5.98%, and African Americans at 1.14%, respectively (Data USA, 2018). Despite the differences among them, ethnic groups in Corvallis live in harmony. There is an estimated 90.4% of residents in Corvallis are US citizens.

3.3 Economy

In 2018, Corvallis household income grew to $49,835, a staggering 7.67% increase in one year, though the average is still lower than the average United States income of $61,937 (Data USA, 2018). The economic growth of Corvallis is mainly attributed to the increase in education services, healthcare accommodation, and food services as these are major sources of income in the area. Wage distribution across races differs, with the Asian population receiving a high income than the other races.

Additionally, the domination of males in the job market means that they recorded a higher return with an estimated 1.29 times more salary than females. The economy of Corvallis is mostly dependent on the student population since its education center has given rise to different service sectors such as accommodation, food, and healthcare.

3.4 Oregon State University

Education is the backbone of Corvallis, with development attributed to the impact of learning institutions in the area. Oregon State University is a public research university in the heart of Corvallis with an estimated population of 32,000 students. The institution has given rise to many service industries like accommodation and restaurants. Students are famed for the fast-food and nightlife and thus the institution has presented a perfect demand in the restaurant industry (Feldman, 1994).

3.5 College Town and City

Corvallis can be considered a college town due to the immense contribution education has played in its growth (Mayer, 2006). However, the town has grown to surpass the college town status and has enhanced its position as a city. Without education in the city though, relatively few business ventures would thrive. Restaurants are would be bound to close since their primary consumers are those involved with the university, the main contributor to growth in the town.

The college town-related sectors are always booming due to the availability of demand compared to the rest of the city. These sectors are reliant on secondary sources that are related to the institutions in one way or another. Cities that don't have colleges are very different from Corvallis because they are not reliant on the education system to provide demand and extensive services. Technical services, utilities, and public administration are among the highest paying industries in Corvallis compared to manufacturing, transport, mining (Henderson et al. 1995), and other major industries in other cities. The college town sector of Corvallis surpasses the rest of the industries in the city due to its contribution to economic growth and returns on investments, thus improving the living standards of the locals and investors alike.

3.6 Restaurants: Visitors and Students

Corvallis restaurants attract visitors with different preferences. The majority of the customers prefer going to the restaurants to watch football. This activity allows people to strengthen bonds and make new friends through socializing. Therefore, these restaurants are the best socializing platform for people in Corvallis, albeit with an exception of social media platforms. Restaurants, in a bid to attract visitors, have installed state-of-the-art television sets and provided proper seating allocations to improve comfort. The college town also offers additional facilities due to demand from the student section. Corvallis is very unique with young students who enjoy eating out, thus providing perfect demand for the restaurants. Many sporting events are held by the school. When there is a football match, the whole family will go to the school to watch the competition, providing a sales opportunity for the school's restaurants.

Corvallis is a unique city that attracts mostly regular customers, unlike tourist cities or big cities that attract new customers. The diversity in the race will be a major factor in visitors accessing Corvallis. Additionally, in the middle of Willamette Valley, there is an increasing number of tourists (Connolly, 2009) visiting or just passing through. Therefore, the city restaurants are likely to also target tourists as part of their growing clientele. On the other hand, the college town restaurants are specifically targeting the students and administrators in the learning institutions (Chen

et al. 2013). The restaurant Pastini is strategically placed on the way to McKenzie River to serve as an attraction to both tourists and students on their way to picnics and site seeing. Chipotle Mexican Grill is famed for its fast-food services, a preference for many students. It is strategically located near Oregon State University to serve the student population who are so in love with chicken flavors. Holy Cow Café, a healthy and international cuisine restaurant, is also located 0.1 miles from Oregon University to serve students from different races and countries. Panda Express and the Evergreen Indian Restaurants are a result of strong Asian influences in the area. There is also Prince Pucklers for ice cream lovers. The restaurants in the college town and the city have embraced a sales approach that targets specific consumers which have fueled their success in the venture both as a college town and city.

4 Data Collection

4.1 Restaurants

The study concentrates on restaurants in Corvallis, with a total of 82 restaurants in operation. Among these local restaurants, 69 have websites, and 13 of them do not have Yelp.com data. These restaurants can be divided into different types depending on the service and food offered. To generate further insights about the sampling location, we took a trip around Corvallis and discovered it is bound by five very distinct sectors: American, Asian, Italian, Mexican, and Others.

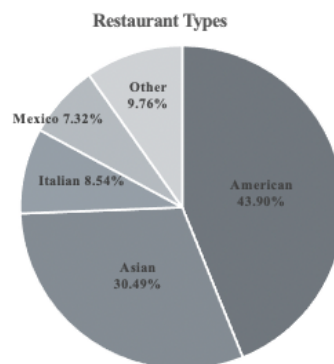|	
American	43.9%
Asian	30.5%
Italian	8.5%
Mexican	7.3%
Others	9.8%

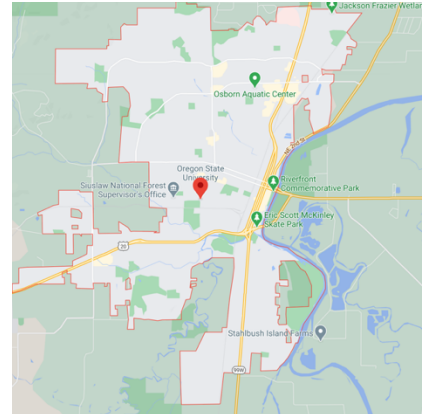Table 1 and Figure 1: Distribution of the Restaurants in Corvallis.

Figure 3 and Figure 4: Location of Corvallis in the state of Oregon and map of Corvallis.

4.2 Variables

I collected the variables from local restaurants' websites and Yelp profiles. The concentration was on whether the restaurant pays attention to its website design. The essential variables of the websites are the time to load a website, the largest contentful paint, first input delay, and cumulative layout shift. The remaining variables, though not very significant, were distributed among the different websites of restaurants depending on functionality and whether they fit the course. Yelp website ratings are more objective and authoritative than the local restaurants' website ratings.

After the collection of variables, I separated all factors into the design of the website display and the restaurant's information. In a separate list, I ensured all variables are classified either as binary or numerical variables hoping to know more accurately what factors lead to the rating of local restaurants by collecting data from different Yelp and restaurant variables and prepared a comprehensive analysis of their relationship between these variables.

The introduction of variables enhances curiosity in the research and ensures that understanding of different factors amounting to the rating of restaurants and the impact consumers are weighted equally. Whether positive or negative outcomes, the variables help in distinguishing the dependent and independent factors in any operation, an aspect that can't be ignored in the case of restaurants and website designs.

Variables collected from restaurant website	Type	Website Design	Restaurant Information
Time to Load Website	Numerical	X	
Largest Contentful Paint(LCP)	Numerical	X	
First Input Delay(FID)	Numerical	X	
Cumulative Layout Shift(CLS)	Numerical	X	
Address of Physical Store	Binary		X
Contact Info	Binary		X
Email Subscription	Binary	X	
Delivery Service	Binary	X	
Welcome Message	Binary	X	
Support of Multiple Languages	Binary	X	
Number of Social Media Platforms	0, 1, 2, 3, 4, 5, 6	X	
Web Production Platform	Binary	X	
COVID-19 Updates	Binary		X
Use of Clear Navigation	Binary	X	
Use of Color	Excellent, good,	X	
Dish Pictures	Excellent, Good, need improveme	X	

Table 2: Variables collected from restuant websites organized by their types and the information provided by them.

Variables collected from yelp.com	Type	Website Design	Restaurant Information
COVID-19 Updates Services	Binary	X	
Claimed	Binary		X
Star Rating	0, 1, 2, 3, 4, 5		X
Health Score	0-100		X
Price Range	1,2,3,4		X
Year of First Review (a proxy for Opening Date)	Numerical	X	
Number of Reviews for Restauant	Numerical		X

Table 3: Variables collected on Yelp organized by their types and the information provided by them.

4.2.1 Information Collected from Restaurants' Websites

1. Time to Load Website

In a fast-rising technology world, access to information has not only been made efficient by telecommunications companies and websites, but there is also an increased preference for websites that provide data in a short timespan. This preference is limited to between 1 to 3 seconds, with many prospective clients opting for alternative websites when the preferred time expires. When its information does not load quickly, websites should figure out how to acquire quicker speed to remain relevant in the market. It is equally important to enhance performance optimization (Manhas, 2013) since page load time can decrease search engine rankings. It is

preferable to collect the data for the local restaurants and separate it into three levels: fast, moderate, or slow, in terms of providing information. The fastest level takes 0-4.3 seconds to provide feedback information. The moderate level takes about 4.4-5.8 seconds while the slowest level takes over 5.8 seconds to load data. As shown in Figure A-1 and Figure H-1, 57.9% of Corvallis restaurant websites had a fast website speed, 20.29% had a moderate speed, and 21.74% of restaurant websites are rated slow.

2. Largest Contentful Paint (LCP)

A slow server has always been among the main causes of poor LCP. It is important for an organization seeking efficiency to enhance LCP since information can only be assumed to have reached the targeted user after loading the whole screen. In a digital world, all information loaded on a screen is vital for information sources. Thus, it is needed to ensure speed and accuracy in delivery. An LCP of 0-2.5 seconds is excellent and offers speedy results. 2.5-4.0 seconds needs improvement for a better aura audience. An LCP taking over 4.0 seconds is poor and needs a total overhaul to improve service delivery. As we can see in Figure A-2 and Figure H-2, the poor LCP level is the majority of Corvallis restaurants 52.17%, good LCP level accounted for 34.78%, and 13.04% of the restaurants are moderate level.

3. First Input Delay (FID)

Time is needed to access a site and when output is delivered, it is equally important that the browser reacts quickly to when the user first interacts with the page, depicting the nature of services offered and the kind of efficiency the user can expect in the long run. FID ensures loading responsiveness is captured among different users to ascertain the level of interpretation of data and the time taken is up according to input choice (Rasvan et al. 2004). A time of 0-100 milliseconds is perfect for website users due to the timely response. A time of 100-300 milliseconds needs some action to improve its efficiency. Anything above 300 milliseconds is deemed to be poor and inefficient and may not give good results in the long run. As we can see in Figure A-3 and Figure H-3, good FID levels in local restaurants make up the majority at 98.53%, 1.47% of restaurants have moderate levels, and there are no poor levels. Most restaurants have resonably good FID.

4. Cumulative Layout Shift (CLS)

While other user-centric metrics focused on time, CLS enhances vision and ensures the user finding a more friendly and delightful page. Websites need to provide visually appealing output to enhance consumption from both prospective and existing clients. Users will always prefer restaurant website pages that have more appealing images. A layout shift displaying in 0-0.1 seconds is excellent, while which of 0.1-0.25 seconds requires some improvement to provide a timely output to the users. Anything above 0.25 seconds is poor and users may not prefer to use these services. As we can see in Figure A-4 and Figure H-4, 50.72% of Corvallis restaurants have good CLS levels, 34.78% have moderate levels, and 14.49% have poor levels.

5. Contact Information

Even before modern computing, contact information has been important in identifying specific producers or organizations. Fast forward to the current economy, contact info is a variable that ensures that a full understanding of the business is delivered to consumers. It holds the core of business operations in a website, therefore, determines the flow of consumers and prospective clients. Increased security measures and the reduction of spam on a website are equally attributed to contact information. It thus plays a vital role in the growth of the website and organization as a whole. See Figure A-5, 98.55% of restaurants have the contact information on the website. Most restaurant's website shows their contact information to help consumers know how they can connect with them.

6. Number of Social Media Platforms

The attraction of sales in the current competitive market can be attributed to the size of social media both in terms of platforms an organization is using as well as the number of followers involved. Social media platforms attract different and unique individual users; thus, it is needed for an organization to embrace all of them to reach the whole consumer field. Additionally, the organizations need to enhance marketing skills to increase followers since they provide an easy audience for which to market products. The number of social media platforms is a good indicator of a restaurant's social media engagement. I define the excellent level to be 5 to 6 social media

platforms on the restaurant's website and good if there are 3-4 platforms. As we can see, 39.13% of Corvallis restaurants are at a moderate level and 10.14% are at a good level, as seen in Figure A-6 and Figure H-5. These local restaurants are not doing enough for social media engagement.

7. Use Clear Navigation

Creating a more user-friendly website cannot be guaranteed without clear navigation. There are always corrupted paths that could suffice but only work for the short-term. Using clear navigation requires the organization to consider both short-term and long-term goals and ensure consumers' security. Most Corvallis restaurants' websites adopt clear navigation to show their information, accounting for 94.2% as seen in Figure A-7.

8. Welcome Message

Identifying users when they open the website helps communicate information and builds confidence among clients. A welcome message is a variable that always identifies the organization to the market, be it with new consumers or loyal customers. Most restaurants' websites include a welcome message to show information, accounting for 91.3% of Corvallis restaurants in Figure A-8.

9. Dish Pictures

Any restaurant business will have to provide images of what they are dealing with on their website. This will ensure the consumer is getting updates on new products and even helps them make decisions on purchases. If a restaurant pictures all dishes I labeled them as Excellent level, near half of the dishes with pictures as Moderate level, very few pictures as Improvement needed, and no pictures at all as Poor level. As shown in Figure A-9 and Figure H-6, 43.48% of Corvallis restaurants are at a poor level and they did not upload pictures of dishes onto the website. They may not care about giving a lot of effort to attract prospective consumers who rely on website information and pictures.

10. Delivery Service

Restaurants should ensure they have a perfect delivery plan launched on websites as it helps enhance their sales and ensures confidence, safety, and hygiene of their food products. It is an important aspect of the website to show that a delivery method

is available to consumers. Half of the local restaurants show their delivery service options on the official website.

11. Support of Multiple Languages

In a multicultural environment, we expect consumers from different ethnic societies. Thus, enhancing the website with additional options for switching languages will increase the scope of consumers. Language barrier will not be a hindrance to future growth (Daries-Ramon et al. 2019). Around 10 percent of Corvallis restaurant websites support multiple languages.

12. Web Production Platform

Technological development is on the rise, thus, new software that can improve the consumer-producer relationship has been introduced to the restaurant market. These updates are very essential in improving the functionality (Hutchens et al. 1997) of websites which enhances productivity growth and returns on investments.

13. COVID-19 Updates on Website

Just like any other health risk, COVID-19 updates should be included on the alert list of websites. Restaurants are famed for being places that spread the virus; thus it is necessary to provide information about health allocations and measures that the organization is taking to keep all clients and workers safe at all times. On local restaurants' website, 20.29% of restaurants have an update with COVID-19 information.

14. Use of Color

Restaurant websites are famed for having more bold colors. Colors play an integral role in attracting people to a website. The combination of color and dish pictures will create an ultimate website for any prospective client which helps increase the chances of sales and return on investment. Additionally, colors can be used in the rating stars to provide an insight into different categories of restaurants on offer. I set three levels to evaluate this variable, good, improvements needed, and poor. From the research, we can see from Figure A-10 and Figure H-7 that 59.42% of Corvallis restaurants need improvement.

15. Address of Physical Store

Just like the contact info., the address ensures easy access for those who are willing to access the restaurant physically. Organizations are quickly adjusting their preferred food delivery service due to the pandemic; some consumers are cultured and prefer eating out or making individual takeout orders, both of which still contribute to sales. Therefore, the website must provide adequate information with an address. Prospective suppliers can also use the same to tender their products. Around 84% of Corvallis restaurants put their physical address on the website.

16. Email Subscription

The website offers a guarantee that the business exists and helps convince consumers to make purchases. This approach can be improved by offering email subscribers additional discounts and guaranteed access to special offers. Subscription will increase traffic to the website which helps increase sales in the long run. Around 84% of restaurants offer an email subscription on their websites.

17. Website Design Score

I set the following variables as binary: address of physical store, contact information, email subscription, delivery service, welcome message, support of multiple languages, web production platforms, COVID-19 updates, and applying clear navigation. Then I summed up the binary variables and called this the website design score. The range of the score is from 0 to 9. Most of the restaurants only received an average score of 6 and 14 restaurant websites received zero, representing local restaurants not putting effort into website design.

4.2.2 Information Collected from Yelp.com

1. COVID-19 Update Services

Yelp website attracts a lot of reviews and traffic and therefore, it is a perfect place to update consumers regarding the pandemic. The website traffic offers a free information space which helps reduce in-person interaction and the spread of COVID-19 in a bid to win the fight over the virus. Also, businesses are allowed to list the extensive health measures they are participating in to provide that knowledge to prospective clients. Most restaurants updated their services like no longer offering a dine-in service during the COVID-19 period.

2. Star Ratings

Rankings of organizations and facilities therein are very essential to consumers. For example, many people would prefer to know the status of the hotel they are checking into even before deciding to book a night. The stars help to provide an insight into what facilities, food, and prices to expect, which is very crucial in decision making. Yellow, orange, and red exemplify the stars rating and the categories for different consumers. Star rating provides an overview of the quality of operation, products, and services rendered, which is very significant for consumers. A 5-star rating is considered as the best, and taking a look at the Corvallis restaurants, only a few meet the criteria for such ranking. This calls for a lot of improvement if they would like to attract more sales, especially among the visitors. Most of Corvallis restaurants are rated 3-3.5 stars on Yelp as shown in Figure H-8.

3. Claimed

Through verification, the website authenticates the owner or representative which provides additional insights into the services offered, hence enhancing the trust of prospective consumers and ensuring market needs are met. There are 54.88% of Corvallis restaurants not claimed on the Yelp website.

4. Health Score

These alerts depict the health situation in a restaurant in the last 6 months and are powered by HDScores. The health score's range is 0 to 100. This score provides vital information for consumers when social distancing and thorough hygiene are required in public facilities (Purnama et al. 2020). The current pandemic has kept many institutions in the spotlight with health issues being a determinant for client demand. Developing a sense of understanding of the need to keep the working environment clean has been essential for many managers since there has been a lot of costs incurred to ensure health status is qualified. By the time the health score has been generated, there are significant inspections that have been done and a full evaluation of whether the restaurants meet the set standards for operations during the pandemic period. Health Score assesses the measures taken in restaurants to secure facility and staff, safeguard clients, and general hygiene. In Corvallis, half of the restaurants are rated 100, less than 3% are rated 50 or less as shown in Figure A-11 and Figure H-9.

5. Price Range

This provides an insight into the average price per person in USD currency. The USD is frequently used because of its universal appeal over the other currencies. The price range is measured by the number of dollar signs on Yelp. Pricing is a very strong factor in the determination of purchase by a consumer. In as much as quality has to be guaranteed, pricing and preference for affordability vary from one client to the other. In developing a price range, one has to consider many underlying factors such as the current economic status in the region of operation and the target market, which in our case is mostly students, thereby leading to the assumption that they are likely not going to pay for high-end meals since affordability is a huge challenge. Although there are concerns for keeping with the market price range, the immediate target market becomes the primary concern in setting up the price range. Providing an estimation of price also enables the restaurant to attract sales since the consumer understands what they will pay per portion, thus creating an avenue for ease of affordability. For this variable, one dollar sign ($) represents the price per person is under $10, $$ is $11-$30, $$$ is $31-$60, and $$$$ is over $61. There are 61.67% of restaurants in the 2 dollars signs range. See Figure A-12 and Figure H-10, most Corvallis restaurants are in 2 dollars signs range.

6. Year of First Review

This represents the date of the first review of a restaurant on Yelp. This variable is used as a proxy for the opening date of the restaurant. Even though the findings may not depict the real picture of the restaurant, it gives the prospective client insights on whether what dining experience they prefer can be attained through a long operating period or a very short time frame. This approach creates concern among restaurant owners but provides prospective consumers with opportunities of trying out new places. Over time it is believed a restaurant can build its image since operational success cannot only be determined by the involvement with Yelp. Other referrals and review sites can work out at a time when the date of the first review is very limited. See Figure A-13 and Figure H-11, the years 2005 to 2012 is the most common time period.

7. Number of Reviews for Restaurant

Any prospective customer of a restaurant would like to get what others feel about the same facility. The reviews provide information to both customers and business owners. Restaurants with more reviews attract more traffic (Hajas et al. 2014) due to the assumption that they have good food quality leading to many consumers.

5 Methodology and Analysis

5.1 Analysis of Variance

A one-way ANOVA test was used to determine whether there were statistically significant differences between different groups. The null hypothesis indicates that the population average is equal. Only categorical variables can be compared against each other using ANOVA. We used a 5% significance level for all hypothesis tests.

Hypothesis 1:

Ho: There is no difference in the star ratings across different levels of social media usage.

Ha: There is some difference in the star ratings across different levels of social media usage.

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	3	3.535	1.178	3.261	**0.026**
Error	77	27.820	0.361		
Corrected Total	80	31.355			

Table 4a: The result of the restaurants' website use of social media and the star rating.

Model parameters (Stars):

Source	Value	Standard error	t	Pr > |t|	Lower bound	Upper bound
Intercept	3.071	0.227	13.519	**<0.0001**	2.619	3.524
Category Social Media-Good	0.000	0.000				
Category Social Media-Moderate	0.384	0.247	1.556	0.124	-0.107	0.875
Category Social Media-Needs improvement	0.606	0.264	2.296	**0.024**	0.080	1.132
Category Social Media-Poor	0.768	0.275	2.792	**0.007**	0.220	1.316

Table 4b: Different levels of social media usage related to the star rating.

Table 4a shows the result of the restaurant's website use on social media and the star rating. The ANOVA test showed that there was a significant difference between these two variables. The *p*-value was 0.026, which was less than the

significant level, so Hypothesis 1 was rejected and concluded that not all population means were equal, and the differences were statistically significant. In other words, Yelps' star rating was different regarding different usages of social media.

Table 4b shows that predictor variables of Social Media-Needs Improvement or Poor have a significant effect on the response variable, restaurant star rating, because their *p*-values were smaller than the significant level of 0.05 (0.024 and 0.007). Compared with predictor variables of Social Media-Good, Corvallis restaurants' website design is not so good and needs to be improved.

Hypothesis 2:

Ho: There is no difference in the star ratings across different levels of dish pictures.

Ha: There is some difference in the star rating across different levels of dish pictures.

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	3	6.670	2.223	5.764	**0.001**
Error	64	24.687	0.386		
Corrected Total	67	31.357			

Table 5a: The result of the restaurant's website use of the dish pictures level and the star rating.

Model parameters (Stars):

Source	Value	Standard error	t	Pr > |t|	Lower bound	Upper bound
Intercept	3.008	0.254	11.863	**<0.0001**	2.501	3.514
Categorical dish pictures-Good	0.000	0.000				
Categorical dish pictures-Moderate	0.206	0.288	0.718	0.476	-0.368	0.781
Categorical dish pictures-Needs improvement	0.833	0.311	2.684	**0.009**	0.213	1.454
Categorical dish pictures-Poor	0.771	0.279	2.769	**0.007**	0.215	1.328

Table 5b: Different levels of dish pictures related to the star rating.

Table 5a shows the result of the restaurant's website use of the dish pictures level and the star rating. The ANOVA test showed that there was a significant difference between these two variables. The *p*-value was 0.001, which was less than the significant level, so Hypothesis 2 was rejected and concluded that not all population means were equal, and the differences were statistically significant. In other words, Yelps' star rating was different regarding the different degree of the dish pictures level.

Table 5b shows that predictor variables of Dish Pictures Need Improvement or Poor has a significant effect on the response variable of restaurant stars value because their *p*-values were smaller than the significant level of 0.05 (0.009and 0.007). Compared with predictor variables of Dish Pictures Good, Corvallis restaurants' website design is not so good and needs to be improved.

Hypothesis 3:

Ho: There is no difference in the website design score (which is a metric created to evaluate the overall design of the restaurant's website) across different levels of updating the COVID-19 on the Yelp website.

Ha: There is some difference in the website design score across different levels of updating the COVID-19 on the Yelp website.

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	1	22.693	22.693	8.336	**0.005**
Error	79	215.074	2.722		
Corrected Total	80	237.767			

Table 6a: The result of the restaurant's website to update the COVID-19 and the website design score.

Source	Value	Standard error	t	Pr > |t|	Lower bound	Upper bound
Intercept	7.814	0.202	38.766	**<0.0001**	7.413	8.216
COVID-19 Updates-No	0.000	0.000				
COVID-19 Updates-Yes	1.400	0.485	2.887	**0.005**	0.435	2.365

Table 6b: COVID-19 update on restaurants' websites related to website design score.

Table 6a shows the result of the restaurant's website to update the Covid-19 and the website design score. The ANOVA test showed that there was a significant difference between these two variables. The *p*-value was 0.005, which was less than the significant level, so Hypothesis 3 null was rejected and concluded that not all population means were equal, and the differences were statistically significant. In other words, updates about COVID-19 on a restaurant's website did have a relationship with the restaurant's website design score.

Table 6b shows that predictor variables of updating Covid-19 significantly affect the response variable of the website's rating value because the *p*-values were smaller than the significant level of 0.05 (0.005).

5.2 Linear regression

Linear regression is used to test the statistical relationship between a set of predictors (X's) and a response variable (Y) and to quantify the impact of each X on Y or predicting Y based on values of X's. If the *p*-value of a predictor variable is less than a predetermined significance level (usually 5%), this indicates that predictor variable has a significant impact on the reponse variable.

Source	Value	Standard error	t	Pr > |t|	Lower bound	Upper bound
Intercept	7.856	0.332	23.644	**<0.0001**	7.192	8.520
Time to Load Website	-0.006	0.100	-0.055	0.956	-0.205	0.194
LCP	0.011	0.044	0.254	0.800	-0.077	0.100
FID	0.001	0.022	0.043	0.966	-0.044	0.046
CLS	0.521	0.442	1.177	0.243	-0.363	1.404

Table 7: Relationship between each numerical website variable and website design score.

The website design score includes some binary data, like the use of color, dish pictures. Other variables for reviewing websites are more objective. Table 7 showed that the predictor variables of Time to load, LCP, FID, and CLS had no significant effect on the response variable of the overall Website design scores because their *p*-values were larger than the common alpha level of 0.05, which indicated that they were not statistically significant on the response variable of the website design score.

5.3 Correlation

	FID*	Social Media Engagement	Welcome Message	Dish Pictures	Delivery Option	Promotions	Covid Updates	Email Subscription
Social Media Engagement								
Welcome Message								
Dish Pictures		0.507	0.306					
Delivery Options	-0.349			0.368				
Promotions				0.438				
Use of Color			-0.411					
Address				-0.361				
Email Subscription		0.380				0.478	-0.343	
Web Design Score		0.518		0.645	0.316	0.748		0.515

Table 8: The result of all website's display correlation (Correlation > 0.5, 0.3>Correlation > 0.5, blank if abs. correlation < 0.3).

In Table 8, the correlation greater than 0.5 has large relation, and the correlation between 0.3 and 0.5 has small relation. As we can see, there are five large correlation groups and ten small correlation groups. The remaining aspects do not have a substantial relationship thus are not worth further description, though the complete table is in the appendix. Now, I will explain each essential correlation below.

1. The promotions and website design scores have a positive relation. When the restaurants put the promotions on their website, the web design score also is high.

2. The dish pictures and website design scores have a positive relation. When the restaurants put lots of dish pictures on their website, the web design score also is high.

3. The social media engagement and website design scores have a positive relation. When restaurants use more social media platforms, the web design score is also high.

4. The email subscription and website design scores have a positive relation. When the restaurants' websites use email subscriptions to attract customers, the web design score is also high.

5. The dish pictures and social media engagement have a positive relation. When the restaurants put lots of dish pictures on their website, they also care more about social media engagement.

For the ten small correlation groups, there is a negative relationship, like Email Subscription with COVID-19 Updates. As we can see, a good website score has a positive relationship with Web Design Score and Dish Pictures. Some variables related to marketing like email subscriptions and promotions have large and positive correlations with website design score.
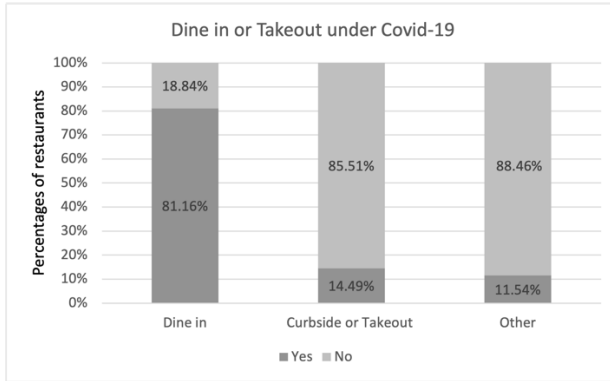
Figure 5: Percentages of restaurants in different subsets.

The COVID-19 announcements on websites have no relationship with COVID-19 announcements on the Yelp website. So, I grouped the variables for COVID-19 and on the Yelp website into the following subsets: Dine-in, Curbside or Takeout, and Others. The conceptual frameworks are laid to enhance comparisons.

Developing a correlation in the elements shows that Health Score and having a COVID-19 update on the website have the strongest relationship. We can therefore understand and uphold the status that when the restaurant pays more attention to COVID-19 updates on the website, they have higher health scores. The Figure H-12 approach shows the high scores in specific restaurants. Therefore, a restaurant needs to embrace both aspects of health score and website design.

5.4 Models

We first run a linear regression model using the star ratings as the dependent variable and Number of Reviews, Date of First Review, and overall Website Design Score, COVID-19 updates and restaurant types. The results are presented in Model 1 below.

Independent variables	Dependent variable: Ratings	
	Coefficients	*p*-value
Number of Reviews	0.002	0.005
Date of First Review	0.07	0.002
Website Design Score	-0.12	0.012
COVID-19 Updates	-0.06	0.851

American	-0.1	0.732
Asian	-0.15	0.624
Italian	-0.06	0.873
Mexican	-0.22	0.588

Model 1: The relations between independent variables and ratings.

In Model 1, we can see Number of Reviews, Date of First Review, and overall Website Design Score all have significant relations with ratings. Restaurant Type is not a significant predictor for Ratings. The Rating ranges from between 0 and 5. The estimated model is

Ratings = -133.693+ 0.002 Num of Review + 0.07 Date of First Review – 0.12 Website Design Score – 0.10 American– 0.15 Asian – 0.06 Italian – 0.22 Mexican – 0.06 COVID-19 Updates

As we can see, Model 1 above shows how I set the *p*-value smaller than 0.1 which provides a positive outlook. From that approach, we can generate more than one output whereby the number of reviews, the start date of reviewing, and the website design score have an integral and strong relationship with the Ratings.

This equation tells me about the relationships between Ratings and other features. For every additional review, the Ratings go up by 0.002% on average. For each increase in the year that the first review was left, the Ratings go up by 0.07% on average. For a decrease of one website design score, the Rating goes down by 0.12% on average.

Mexican is more strongly related to Ratings than other types of restaurants. This equation means that if it is a Mexican restaurant, the Ratings are 0.22% lower than average. Being an Asian restaurant on average decreases Ratings by -0.15%. Italian restaurants have a decrease in 0.06% of Ratings on average. We have created a reference level (Others) that develops a correlation with the restaurants to give a comparison of factors. The existence of reference levels is attributed to the increasing in differential restaurants at a time when growth in the industry is being experienced immensely.

I will explain this result in the second research question. For each decline of one website design score, the health score goes down by 1.5% on average. If the website had a COVID-19 update, the health score goes up by 8.2% on average.

Despite the fluctuation in Ratings at every interval, it is very evident that the contribution of COVID-19 updates cannot be ignored. The pandemic has harmed many businesses apart with very few positive returns attained in recent months.

COVID-19 updates have damaged the scope of international business and affected restaurants significantly. There has been a growing concern on the future existence of said business with many people opting to do business from home as well as eating from home. A look at the restaurant business provides insights into the current economic shape of various countries. Restaurants provide an insight into how the economy has recovered since there is are a number of job creations and income opportunities that are related to increasing consumption in the restaurant industry. Many employed people or those doing business used to prefer to set up meetings at such eateries as a way of connecting with their colleagues or prospective business partners.

However, with social distancing and reduction of operations, there has been a negative effect on the restaurants and the economy as a whole. This experience has pushed many restaurant owners out of business with the lack of a foreseeable end of the pandemic. The few very lucky restaurant owners who had embraced e-commerce through online ordering and home deliveries are likely to survive the test of time, having changed their costing structures and they are limited to online sales at the moment. Most reviews are done online which is a perfect platform for referrals and increasing sales despite the pandemic. Government restrictions have also limited dining in at restaurants as their capacity is limited to enable effective implementation of health guidelines.

Independent variables	Dependent variable: Health Score	
	Coefficients	p-value
Claim	-4.4	0.082

Website Design Score	-1.5	0.011
COVID-19 Updates	-8.2	0.031
American	1.9	0.633
Asian	-10.4	0.010
Italian	-1.0	0.816
Mexican	1.8	0.733

Model 2: The relations between independents variables and health score.

In Model 2 we can seethat both Asian restaurants and the COVID-19 updates service on Yelp have a significant relation with Health Score. The Health Score ranges between 0 and 100. The equation is as below:

Health Score = 111.3 – 4.4 Claimed – 1.5 Website Design Score + 1.9 American – 10.4 Asian-1.0 Italian+1.8 Mexican– 8.2 COVID-19 Updates

As we can see the Model 2 above shows how I set the p-value smaller than 0.1 which provides a positive outlook.

We can see being claimed on Yelp, website design score, COVID-19 updates, and Asian restaurants have stronger relationships with Health Score. The equation tells me the relationships between Health Score and other features. If the restaurant is claimed on Yelp, the health score goes down by 4.4% on average. Asian restaurants have a stronger relationship than other types of restaurants in relation to health scores. This equation means that Asian restaurants have a Health Score of 10.4 points lower than average. If the restaurant is American food, the health score goes up by 1.89% on average. Being an American restaurant has a positive effect on the health score. We have a reference level; the reference level is other restaurants.

I will explain this result in research question 4. For every point decrease website design score, the health score goes down by 1.5% on average. If the restaurant has a COVID-19 update, the health score goes up by 8.2% on average.

6 Research Question Results

Research Question	Evidence	Results
Research Question 1: Website Design on Ratings?	ANOVA test for Hypothesis 1 ANOVA test for Hypothesis 2 Linear Model 1	Ratings vary across different levels of social media engagement. Ratings vary across different levels of dish pictures on restaurant website. Website Design Score has a significantly negative effect on Ratings.
Research Question 2: Restaurants Hygiene on	Linear Model 1	Health Score does not affect Ratings.
Research Question 3: Relationship Between Hygiene and Price?	ANOVA test for Hypothesis 5	Health Score does not vary across different price ranges.
Research Question 4: Relationship Between Hygiene and Restaurant Type?	ANOVA test for Hypothesis 5 Linear Model 2	Asian restaurants generally have lower with Health Score. Asian restaurants generally have lower negative relation with Health Score.
Research Question 5: Chain vs Local Restaurants?	Claimed variable information from Yelp.com	All unclaimed restaurants on Yelp are local restaurants.

Table 9: Evidence and results for the five research questions.

Research Question 1: Do better website designs improve restaurant ratings?

Through analysis of the ANOVA, only social media engagement and dish pictures on the restaurant website relate to the restaurant ratings among all the hypotheses I made. Since the *p*-values are all less than 0.05, these two variables are related to the ratings. In Model 1, the coefficient of the website design score was -0.12. This means that the higher the website design score, the lower the restaurant ratings.

There is a significant negative relationship between restaurant website designs and restaurant ratings. Local restaurants seem to prefer to attract customers with their services and food, rather than paying special attention to the website design. This approach focuses more on consumers' immediate needs compared to market trends and new developments in the industry. It is very obvious that with new technology being released, market forces are pushing the restaurant industry to adapt website designs and encourage customer ratings in a bid to have international appeal and attract consumers across the globe. However, with consistent competition among the readily available restaurants, it boils down to service and quality of product in this case.

Additionally, students from different backgrounds will always want to explore new cultures. Thus, Corvallis restaurants are limiting their access to the market

without using website design since students want easy access to information about local restaurants. As much as website design is the new trend in restaurant operations and ratings, the old fashioned way of making sales (Gheribi, 2017) still works in some areas effectively, albeit with the help of the prospective consumers who are keen on the physical service and the quality of products on offer and leave reviews.

Research Question 2: Does restaurant hygiene and cleanliness help with ratings?

In Model A-1, the *p*-value of the website design score was 0.48. The *p*-value is too big, so the health score does not affect ratings.

These ratings all come from customers and the customers do not enter the kitchen to assess their hygiene and cleanliness. It is quite challenging to ascertain the degree of cleanliness of a restaurant from a consumer's perspective. Restaurants are often keener on consumer preference than health score. Some restaurants don't pay much attention to hygiene in their restaurants because they use ingredients that can be used quickly and immediately. They also may not pay much attention to the hygiene of their restaurants because they care more about improving the immediate success of their restaurants.

Research Question 3: What is the relationship between the health score and restaurant price range?

Through ANOVA, among the hypotheses I made, the *p*-value was 0.175, which was bigger than the set significant level. The health score of restaurants was no different regarding the price range.

When all other variables were equal, there was a negative relationship between a restaurant's health score and the number of dollars signs. Pricing of food definitely involves two significant aspects: the quality and service rendered. Health measures do not really apply in the quality since different consumers have different tastes and preferences thus creating a mixed feeling on whatever is best. Corvallis is an urban center divided into two distinct towns: the educational town and the administrative town. It's quite normal for any town to have an administrative center considering globalization and trade across different sectors. However, Corvallis has an additional side that is attributed to higher learning institutions. These institutions have created a home for many students who cross borders to seek education,

providing a readily available market for restaurants. Students are known for having low budgets, thus affordability is always one of the priorities when they are spending money. This notwithstanding the health impacts of some of the products they consume. The health score of some restaurants in Corvallis may not be that high but they still have a huge number of consumers because of their favorable pricing. Customers are unable to see the cleanliness of a restaurant kitchen, but they do see the price.

Research Question 4: Which types of restaurants have better hygiene and cleanliness?

Through ANOVA test and Model 2, compared to other types of restaurants, Asian restaurants score has a lower negative relation with Health Score (-10.4), and the health score of American restaurants is relatively high (1.9). Asian restaurants have a large negative coefficient with a health score.

Asian restaurants may not pay much attention to hygiene in their restaurants because they use food materials quickly and immediately. They also don't pay much attention to their restaurants' hygiene because they care more about the business of their restaurants.

Research Question 5: What are the differences between chain restaurants and local restaurants?

I compared the claimed restaurants on Yelp and unclaimed restaurants. All unclaimed restaurants on Yelp are local restaurants. Restaurants need to upload documents and photos to be claimed on Yelp.

Local restaurants do not claim as many businesses as franchised or chained restaurants do on Yelp. Meeting consumer demands has always required a strategic approach in the market. Franchised and chained stores always perform a feasibility study on prospective markets before entry ensuring there is potential demand. Taking a look at Corvallis, there are a lot of local restaurants with links to different cultures depending on ownership or style of cooking. Chain restaurants pay more attention to Yelp certification because a good certificate can make it easy for customers to do business with them and give potential customers the confidence to choose them.

This approach has ensured that local restaurants are only limited to either the educational town or the administrative part unlike McDonald's, KFC, or other big outlets with branches across the world. Yelp website offers insightful details on restaurants (Salehi-Esfahani et al. 2019) thus helping to appeal to the international market, an area where franchises and chain stores thrive in making returns on their investments. Although significant amounts of profits are made, the local restaurants are dependent on Corvallis with low risk and return rate compared to the local chain stores with subsidiaries across towns and borders.

7 Conclusion

The COVID-19 menace has limited physical operations due to the risks associated with the spread of the virus. The research questions were all aimed at developing a comparison between sales on a website and normal operations, considering other essential services and information like health and quality of offerings. The website Yelp has been effective in comparing local restaurant websites. As the restaurant industry relies on service, it is advisable to use Yelp. As changes in the market occur, Yelp has provided consumers with easy access to vital information and has acted as a recommendation center. Most restaurants pursuing sustainable growth should consider checking out the requirements to utilize Yelp. Currently, health score is the most important factor for consideration due to the pandemic. But as time goes by, other factors will also come into play their roles such as the price range and general website design. For visitors, after the restaurants finally open up for operations, the star ratings will be very important. The restaurants with higher health scores and high stars may continue to hold an advantageous position within the market. Updated COVID-19 information has a slight relationship with the health score. We know that all health scores on Yelp come from HDScores. These scores were completely updated before COVID-19 but have not been updated since the pandemic.

In this data analysis, I found that the website design has a significantly negative effect on restaurant ratings. In general, Corvallis customers rated the restaurants with elaborate website designs low. This entails that customers have low interest in website designs and are more interested in the food quality, and many probably have not visited these websites. The restaurant owners should not spend time and resources on their website design but focus on improving food quality and service instead.

Resources spent on social media are not effective in improving restaurant ratings in Corvallis. I have always felt that restaurant promotion is very important, but in my survey, restaurants did not promote themselves through these social media platforms. These businesses rely on old customers recommending new customers to

increase their sales and promote their businesses. In the future, concerns for website design and reduction in physical visiting may be increased. In subsequent investigations, I will focus on other factors during the COVID-19 period.

8 References

Chen, Sandy & Elston, Julie. (2013). Entrepreneurial motives and characteristics: An analysis of small restaurant owners. International Journal of Hospitality Management.35. 294-305.10.1016/j.ijhm.2013.07.002.

Connolly, Thomas. (2009). Willamette Valley, Western Oregon: The Long History of Settlements in an Interior Valley.

Cook, Peter. (2014). The Worldwide Abalone Industry. Modern Economy. 5. 1181 1186.10.4236/me.2014.513110.

Daim, Tugrul & Basoglu, Nuri & Gunay, Deniz & Yildiz, Ceren & Gomez, Fredy. (2013). Exploring technology acceptance for online food services. Int. J. of Business Information Systems. 12. 383 - 403. 10.1504/IJBIS.2013.053214.

Daries-Ramon, Natalia & Cristobal, Eduard & Marine-Roig, Estela. (2019). Deployment of Restaurants Websites' Marketing Features: The Case of Spanish Michelin-Starred Restaurants. International Journal of Hospitality & Tourism Administration. 20. 249-280. 10.1080/15256480.2017.1383961.

DATA USA 2018 https://datausa.io/profile/geo/corvallisor#:~:text=The%205%20largest%20ethnic %20groups,and%2090.4%25%20are%20U.S.%20citizens.

Djekic, Ilija & Kane, Kevin & Tomic, Nikola & Kalogianni, Eleni & Rocha, Ada & Zamioudi, Lamprini & Pacheco, Rita. (2016). Cross-cultural consumer perceptions of service quality in restaurants. Nutrition & Food Science. 46. 827 - 843. 10.1108/NFS-04-2016-0052.

Feldman, M. (1994) The university and economic development: the case of Johns Hopkins University and Baltimore, Economic Development Quarterly, 8(1).

Gheribi, Edyta. (2017). Innovation strategies in restaurant business. Ekonomika i Organizacja Przedsiębiorstwa.

Hajas, Peter & Gutierrez, Louis & Krishnamoorthy, Mukkai. (2014). Analysis of Yelp Reviews.

Henderson, J. & Turner, Matthew & Kuncoro, Ari. (1995). Industrial Development in Cities.

Ma, Guansheng. (2015). Food, eating behavior, and culture in Chinese society. Journal of Ethnic Foods. 2. 10.1016/j.jef.2015.11.004.

Manhas, Dr. (2013). A Study of Factors Affecting Websites Page Loading Speed for Efficient Web Performance. International Journal of Computer Sciences and Engineering.

Mayer, Heike. (2006). What is the Role of Universities in High-tech Economic Development? The Case of Portland, Oregon, and Washington, DC. Local Economy. 21. 292-315.10.1080/02690940600808362.

Purnama, Sang & Susanna, Dewi. (2020). Hygiene and Sanitation Challenge for COVID-19 Prevention in Indonesia. Kesmas: National Public Health Journal. 15.10.21109/ kesmas.v15i2.3932.

Rasvan, Vladimir & Popescu, Dan. (2004). Control of Systems with Input Delay—An Elementary Approach. 10.1007/978-3-642-18482-6_7.

Salehi-Esfahani, Saba & Kang, Juhee. (2019). Why do you use Yelp? Analysis of factors influencing customers' website adoption and dining behavior. International Journal of Hospitality Management. 78. 179-188. 10.1016/j.ijhm.2018.12.002.

Şengel, Ümit & Çevrimkaya, Mustafa & Işkın, Merve & Zengin, Dr. Burhanettin & sarıışık, Mehmet. (2020). The Effects of Novel Coronavirus (COVID-19) on Hospitality Industry: A Case Study. Journal of Tourism and Gastronomy Studies. 8. 1646-1667.10.21325/jotags.2020.626.

Shahbaz, Muhammad & Bilal, Muhammad & Moiz, Abdul & Zubair, Shagufta & Iqbal, Hafiz. (2020). Food Safety and COVID-19: Precautionary Measures to Limit the Spread of Coronavirus at Food Service and Retail Sector. Journal of Pure and Applied Microbiology. 14. 10.22207/JPAM.14.SPL1.12.

Winkler, Daniel. (2009). Caterpillar Fungus (Ophiocordyceps Sinensis) Production and Sustainability on the Tibetan Plateau and in the Himalayas. Asian Medicine. 5. 291-316.10.1163/157342109X568829.

Yuan, Yaqun & Li, Fan & Dong, Rh & Chen, Jingsi & He, Geng-Sheng & Li, Shu-Guang &Chen, Bo. (2017). The Development of a Chinese Healthy Eating

Index and Its Application in the General Population. Nutrients. 9. 977. 10.3390/nu9090977.

9 Appendix

9.1 Appendix – Charts

Figure A-1 and Figure H-1: The percentages of Time to Load Website on local restaurants websites.

Figure A-2 and Figure H-2: The percentages of LCP levels on local restaurants websites.

Figure A-3 and Figure H-3: The percentages of FID levels on local restaurants websites.

Figure A-4 and Figure H-4: The percentages of CLS levels on local restaurants websites.

Figure A-5: Contact information on the website or not.
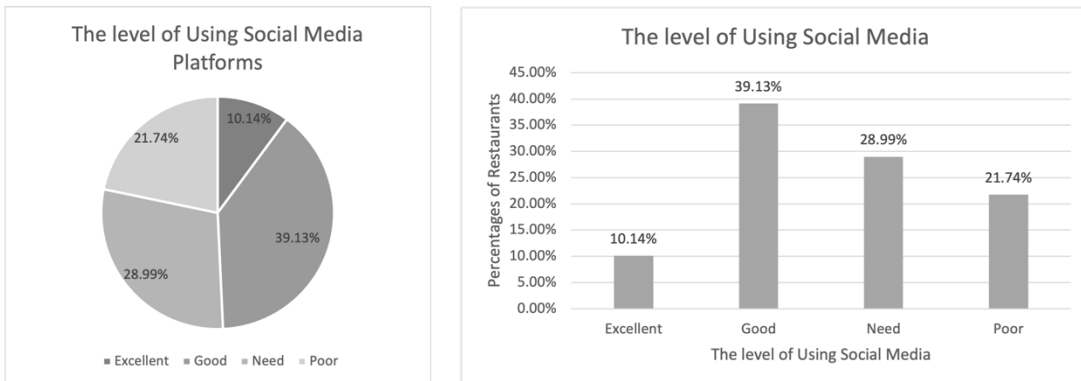
Figure A-6 and Figure H-5: The percentages of using social media levels on local restaurants websites.
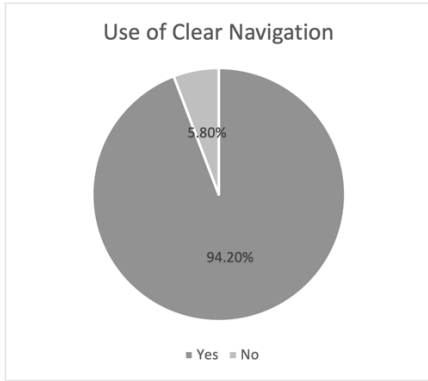
Figure A-7: Clear navigation on the website or not.

Figure A-8: Welcome message on the website or not.
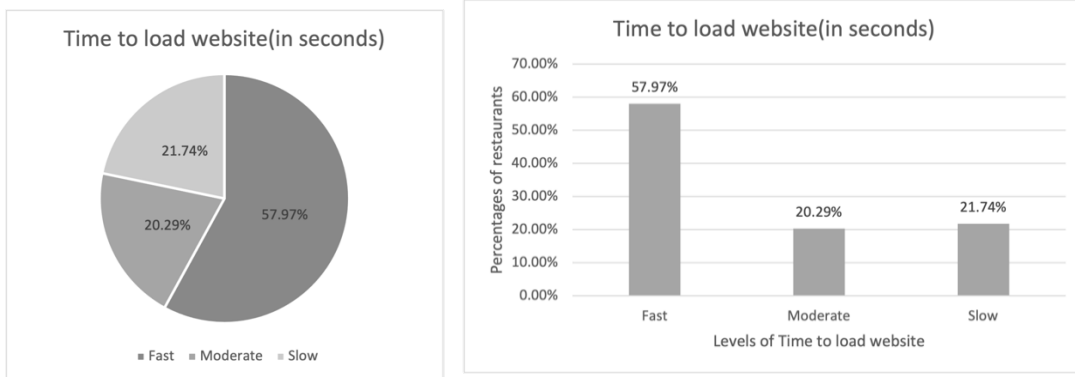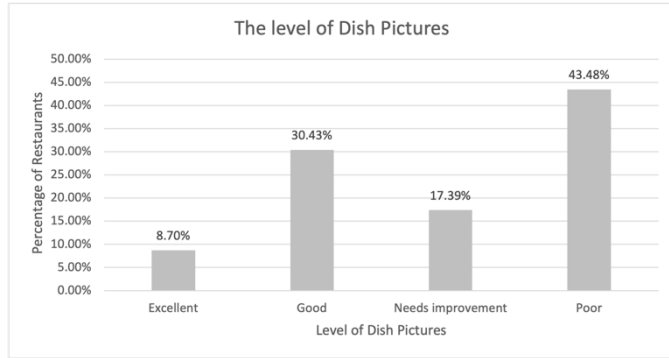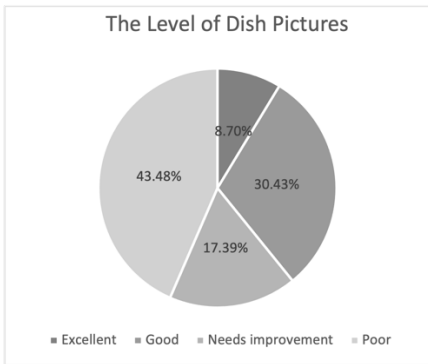

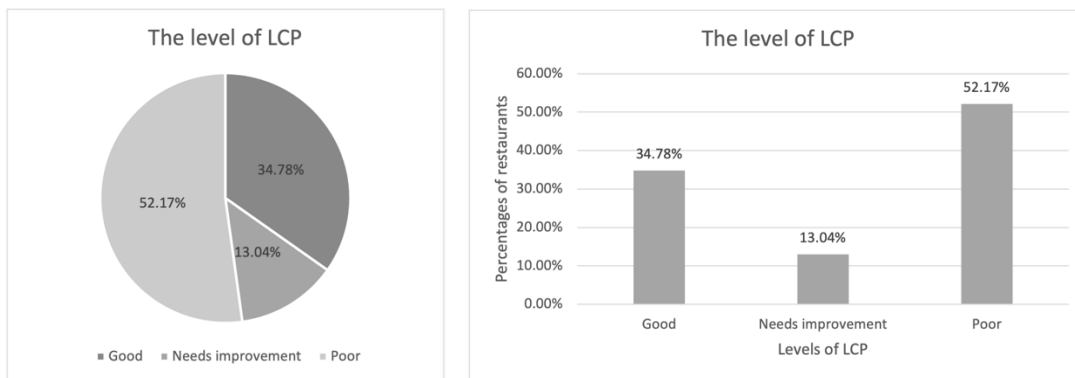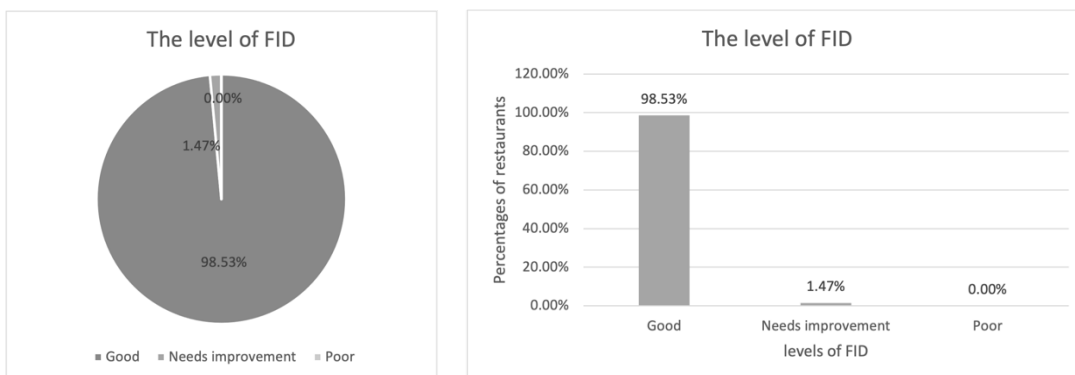
Figure A-9 and Figure H-6: The percentages of dish picture levels on local restaurants websites.

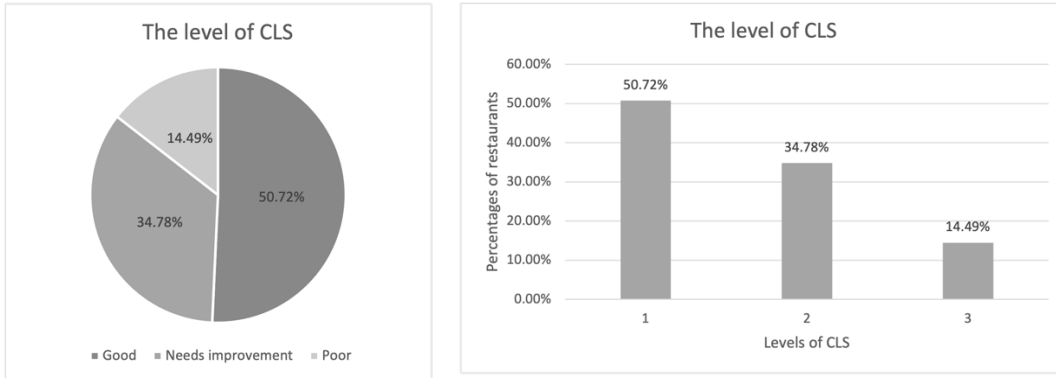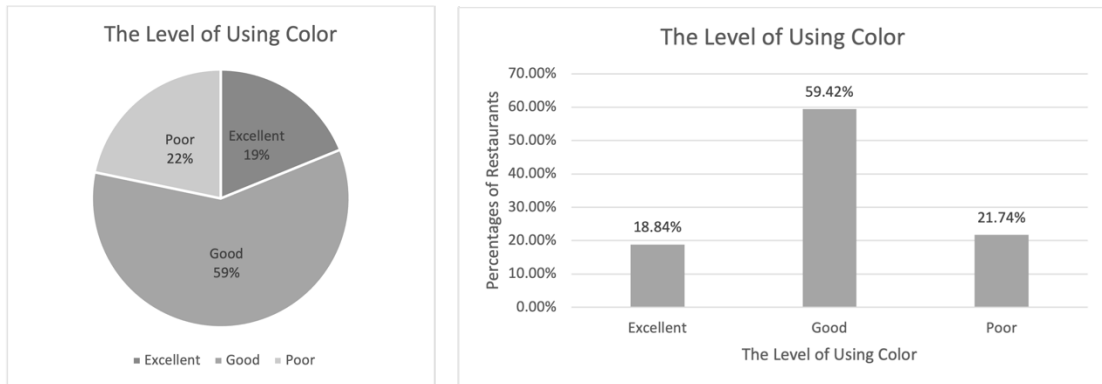Figure A-10 and Figure H-7: The percentages of dish picture levels on loca restaurants websites.

Figure H-8: The percentages of star rating on yelp websites.
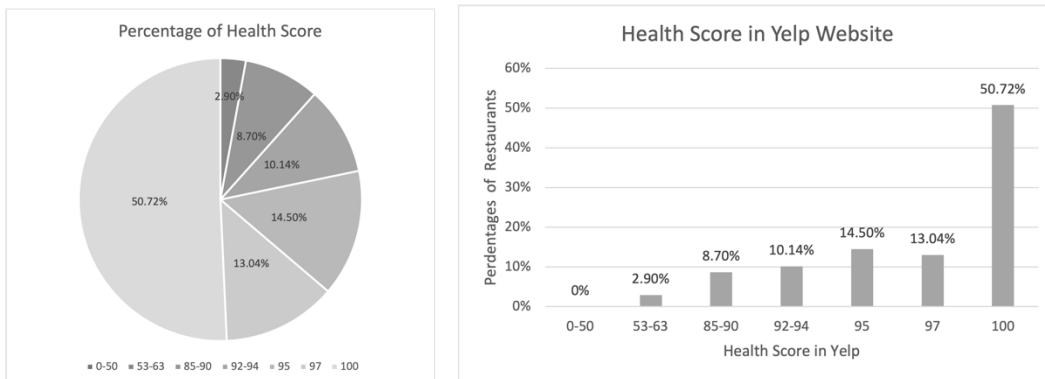
Figure A-11 and Figure H-9: The percentages of different health scores on Yelp websites.
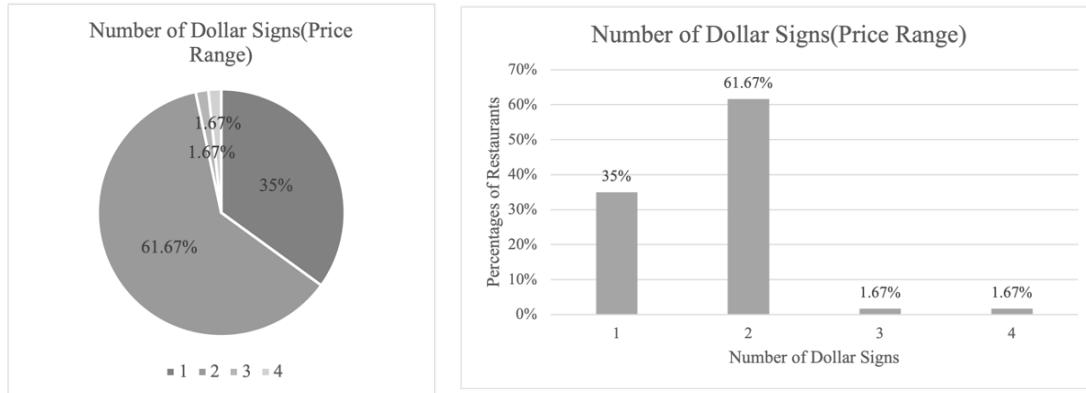
Figure A-12 and Figure H-10: The percentages of health score on Yelp websites.
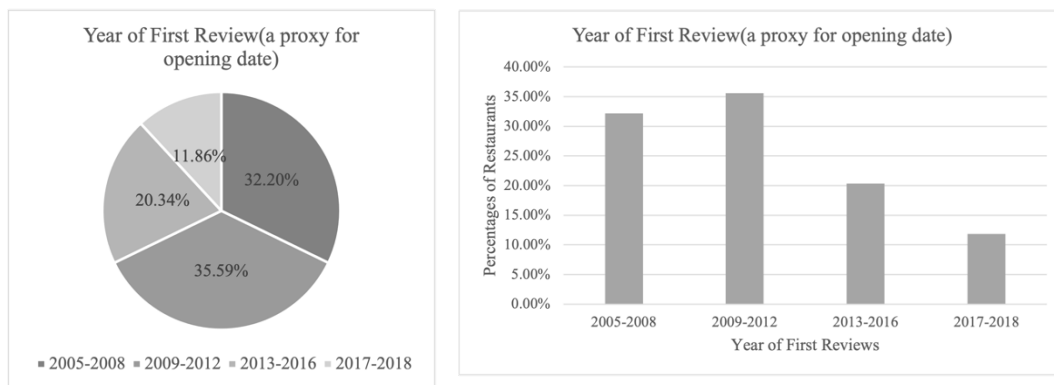
Figure A-13 and Figure H-11: The percentages of first review year on Yelp websites.

9.2 Appendix – Hypotheses

Hypothesis 4:

Ho: There is no difference in the star ratings across different levels of use of color.

Ha: There is some difference in the star ratings across different levels of use of color

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	2	0.212	0.106	0.221	0.802
Error	65	31.146	0.479		
Corrected Total	67	31.357			

Table A-1: The result of the restaurants' website use of color and the star rating.

Source	Value	Standard error	t	Pr > |t|	Lower bound	Upper bound
Intercept	3.667	0.200	18.349	**<0.0001**	3.268	4.066
Use of Color-Good	0.000	0.000				
Use of Color-Needs improvement	-0.139	0.227	-0.611	0.543	-0.593	0.315
Use of Color-Poor	-0.160	0.268	-0.598	0.552	-0.696	0.375

Table A-2: Different levels of color usage related to star rating.

Table A-1 shows the result of the restaurant's website using the color level and the star rating. The ANOVA test showed that there was a significant difference between these two variables. The *p*-value was 0.802, which was more than the significant level, so Hypothesis 4 was not rejected and concluded that all population means were equal, and no differences were statistically significant. In other words, Yelps' star rating was no different across different levels of using of color.

Table A-2 shows that predictor variables of using color Need improvement or Poor have no significant effect on the response variable of restaurant stars value compared with predictor variables. Corvallis restaurants don't care about their website design and focus on the other factors.

Hypothesis 5:

Ho: There is no difference in the health score across different types of restaurants.

Ha: There is some difference in the health score across different types of restaurant.

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	4	451.999	113.000	2.015	0.103
Error	64	3589.628	56.088		
Corrected Total	68	4041.627			

Table A-3: The result of the restaurants' type and the health score.

Source	Value	Standard error	t	Pr > |t|	Lower bound	Upper bound
Intercept	99.192	3.057	32.443	**<0.0001**	93.084	105.300
Restaurant Type-American	-2.628	3.324	-0.791	0.432	-9.268	4.012
Restaurant Type-Asian	-8.039	3.530	-2.277	**0.026**	-15.091	-0.986
Restaurant Type-Italian	-4.067	4.045	-1.006	0.318	-12.147	4.013
Restaurant Type-Mexican	-3.692	4.834	-0.764	0.448	-13.350	5.965
Restaurant Type-other	0.000	0.000				

Table A-4: Different types of restaurants related to the star rating.

Table A-3 shows the result between health scores and different types of restaurants. The ANOVA test showed that there was no significant difference between these two variables. The *p*-value was 0.103, which was bigger than the significant level, so we fail to reject Hypothesis 5 and concluded that all population

means were equal, and the differences were not statistically significant. In other words, the health score was no different regarding different types of restaurants.

Hypothesis 6:

Ho: There is no difference in the health score across different levels of social media.

Ha: There is some difference in the health score across different levels of social media.

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	3	264.863	88.288	1.539	0.213
Error	64	3672.174	57.378		
Corrected Total	67	3937.037			

Table A-5: The result of the restaurants' website use of social media and the health score.

Table A-5 shows the result of the restaurant's website used on social media and health score. The ANOVA test showed that there was no significant difference between these two variables. The *p*-value was 0.213, which was bigger than the significant level, so we fail to reject Hypothesis 6 and concluded that all population means were equal, and no differences were statistically significant. In other words, the health score of restaurants was no different regarding different degrees of social media.

Hypothesis 7:

Ho: There is no difference in the health score across different levels of restaurant's website use of the dish pictures.

Ha: There is some difference in the health score across different levels of restaurant's website use of the dish pictures.

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	3	200.708	66.903	1.350	0.265
Error	77	3817.132	49.573		
Corrected Total	80	4017.839			

Table A-6: The result of the restaurants' website use of dish pictures and the health score.

Table A-6 shows the result of the restaurant's website using dish pictures level and the health score. The ANOVA test showed that there was no significant difference between these two variables. The p-value was 0.265, which was bigger than the significant level, so we fail to reject Hypothesis 7 and concluded that all population means were equal, and the no differences were statistically significant. In other words, the health score of restaurants was no different across different dish picture levels.

Hypothesis 8:

Ho: There is no difference in the health score across different levels of the restaurant's website use of color.

Ha: There is some difference in the health score across different levels of the restaurant's website use of color.

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	2	59.309	29.654	0.581	0.562
Error	78	3978.863	51.011		
Corrected Total	80	4038.172			

Table A-7: The result of the restaurants' website use of color and the health score.

Table A-7 shows the result of the restaurant's website using the color level and the star rating. The ANOVA test showed that there was no significant difference between these two variables. The p-value was 0.562, which was bigger than the significant level, so we fail to reject Hypothesis 8 and concluded that all population means were equal, and the no differences were statistically significant. In other words, the health score of restaurants was no different across different color levels.

Hypothesis 9:

Ho: There is no difference in the health score across different levels of updating the Covid-19 on Yelp.

Ha: There is some difference in the health score across different levels of updating the Covid-19 on Yelp.

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	1	213.151	213.151	3.698	0.059
Error	66	3804.633	57.646		
Corrected Total	67	4017.784			

Table A-8: The result of the restaurants' updating the Covid-19 and the health score on Yelp.

Table A-8 shows the result of the restaurant's website with updated COVID-19 information and the health score. The ANOVA test showed that there was no significant difference between these two variables. The *p*-value was 0.059, which was bigger than the significant level, so we fail to reject Hypothesis 9 and concluded that all population means were equal, and the no differences were statistically significant. In other words, the health score of restaurants was no different regarding the Covid-19 update or not.

Hypothesis 10:

Ho: There is no difference in the health score across different levels of the price range.

Ha: There is some difference in the health score across different levels of the price range.

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	1	135.085	135.085	1.891	0.175
Error	54	3857.897	71.443		
Corrected Total	55	3992.982			

Table A-9: The result of the restaurants' price range and the health score.

Table A-9 shows the result of the restaurant's price range and the health score. The ANOVA test showed that there was no significant difference between these two variables. The *p*-value was 0.175, which was bigger than the significant level, so fail to reject Hypothesis 10 and concluded that all population means were equal, and the no differences were statistically significant. In other words, the health scores are about the same across different price ranges.

	Dish Pictures	Delivery	Promotions	Web Covid Updates	Subscription	Claimed	Num of Review	Start of Reviewing	Yelp Covid Updates	Stars
Dish Pictures	1	0.462	0.424	0.033	0.266	0.319	-0.392	0.116	0.195	-0.391
Delivery	0.462	1	0.374	0.137	0.192	0.409	-0.082	0.029	0.221	-0.195
Promotions	0.424	0.374	1	0.234	0.333	0.224	-0.214	0.081	0.247	-0.351
Web Covid Updates	0.033	0.137	0.234	1	-0.023	0.182	0.017	-0.097	0.088	-0.081
Subscription	0.266	0.192	0.333	-0.023	1	0.242	-0.177	-0.064	0.051	-0.234
Claimed	0.319	0.409	0.224	0.182	0.242	1	-0.186	0.040	0.184	-0.339
Num of Review	-0.392	-0.082	-0.214	0.017	-0.177	-0.186	1	-0.157	-0.210	0.382
Start of Reviewing	0.116	0.029	0.081	-0.097	-0.064	0.040	-0.157	1	0.078	0.260
Yelp Covid Updates	-0.195	-0.221	-0.247	-0.088	-0.051	-0.184	0.210	-0.078	1.000	0.014
Stars	-0.391	-0.195	-0.351	-0.081	-0.234	-0.339	0.382	0.260	-0.014	1

Table A-10: Provision of the Correlation among all variables.

	Dine in	Curbside or Takeout	Others	Web Covid Updates	Health Score
Dine in	1	-0.820	-0.129	-0.218	-0.035
Curbside or Takeout	-0.820	1	-0.462	0.120	-0.022
Others	-0.129	-0.462	1	0.129	0.093
Web Covid Updates	**-0.218**	0.120	0.129	1	0.261
Health Score	-0.035	-0.022	0.093	**0.261**	1

Table A-11: Provision of the Correlation among three types of delivery website Covid-19 update.

	Dine in	Curbside or Takeout	Others	Web Covid Updates	Stars
Dine in	1	0.154	-0.232	-0.143	0.155
Curbside or Takeout	0.154	1	-0.916	-0.268	-0.142
Others	-0.232	-0.916	1	0.246	0.072
Web Covid Updates	-0.143	-0.268	0.246	1	0.090
Stars	0.155	-0.142	0.072	0.090	1

Table A-12: The Correlation among three types of delivery website with COVID-19 updates and Stars. The result is that there is no correlation between these two variables.

Goodness of fit statistics (Stars):

Observations	53
Sum of weights	53
DF	41
R²	0.452
Adjusted R²	0.305
MSE	0.303
RMSE	0.551
MAPE	11.955
DW	1.617
Cp	12.000
AIC	-52.841
SBC	-29.197
PC	0.868

Analysis of variance (Stars):

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	11	10.273	0.934	3.079	**0.004**
Error	41	12.434	0.303		
Corrected Total	52	22.708			

Computed against model Y=Mean(Y)

Model parameters (Stars):

Source	Value	Standard error	t	Pr > |t|	Lower bound	Upper bound
Intercept	-131.625	46.052	-2.858	**0.007**	-224.630	-38.620
Claimed	-0.265	0.212	-1.249	0.219	-0.693	0.164
Health Score	-0.008	0.011	-0.713	0.480	-0.029	0.014
Num of Dollars	0.123	0.187	0.657	0.515	-0.254	0.499
Num of Review	0.002	0.001	2.342	**0.024**	0.000	0.003
Start of Reviewing	0.068	0.023	2.959	**0.005**	0.022	0.114
Website Design Score	-0.142	0.051	-2.799	**0.008**	-0.245	-0.040
Restaurant Type-American	0.255	0.374	0.681	0.500	-0.501	1.011
Restaurant Type-Asian	0.005	0.409	0.012	0.990	-0.821	0.831
Restaurant Type-Italian	0.144	0.423	0.340	0.736	-0.711	0.999
Restaurant Type-Mexican	0.189	0.493	0.382	0.704	-0.808	1.185
Restaurant Type-other	0.000	0.000				
COVID-19 Updates Services	-0.229	0.358	-0.640	0.526	-0.951	0.493

Model A-1: The relations between independent variables and ratings.

Goodness of fit statistics (Stars):

Observations	58
Sum of weights	58
DF	49
R²	0.380
Adjusted R²	0.279
MSE	0.322
RMSE	0.567
MAPE	12.806
DW	1.608
Cp	9.000
AIC	-57.579
SBC	-39.035
PC	0.847

Analysis of variance (Stars):

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	8	9.673	1.209	3.760	**0.002**
Error	49	15.758	0.322		
Corrected Total	57	25.431			

Computed against model Y=Mean(Y)

Model parameters (Stars):

Source	Value	Standard error	t	Pr > |t|	Lower bound (95%)	Upper bound
Intercept	-133.693	43.148	-3.098	**0.003**	-220.402	-46.985
Num of Review	0.002	0.001	2.908	**0.005**	0.001	0.004
Start of Reviewing	0.069	0.021	3.196	**0.002**	0.025	0.112
Website Design Score	-0.120	0.046	-2.607	**0.012**	-0.212	-0.027
Restaurant Type-American	-0.100	0.291	-0.345	0.732	-0.686	0.485
Restaurant Type-Asian	-0.148	0.299	-0.494	0.624	-0.749	0.453
Restaurant Type-Italian	-0.055	0.341	-0.161	0.873	-0.740	0.631
Restaurant Type-Mexican	-0.219	0.402	-0.545	0.588	-1.027	0.589
Restaurant Type-other	0.000	0.000				
COVID-19 Updates Services	0.057	0.304	0.189	0.851	-0.554	0.669

Model A-2: The relations between independent variables and ratings after removing the insignificant independent variables in Model A-1. Note that Model A-2 is the same as Model 1 in the manuscript.

Regression of variable Health Score:

Goodness of fit statistics (Health Score):

Observations	53
Sum of weights	53
DF	42
R²	0.322
Adjusted R²	0.161
MSE	62.611
RMSE	7.913
MAPE	5.689
DW	1.608
Cp	11.000
AIC	228.929
SBC	250.602
PC	1.033

Analysis of variance (Health Score):

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	10	1249.169	124.917	1.995	0.059
Error	42	2629.662	62.611		
Corrected Total	52	3878.830			

Computed against model Y=Mean(Y)

Model parameters (Health Score):

Source	Value	Standard error	t	Pr > |t|	Lower bound	Upper bound
Intercept	162.559	661.219	0.246	0.807	-1171.834	1496.953
Claimed	-4.764	2.958	-1.610	**0.115**	-10.733	1.206
Num of Dollars	-1.389	2.672	-0.520	0.606	-6.782	4.004
Num of Review	-0.006	0.011	-0.533	0.597	-0.028	0.016
Years of Reviewing	-0.023	0.330	-0.070	0.945	-0.689	0.643
Website Design Score	-1.759	0.678	-2.596	**0.013**	-3.127	-0.392
Restaurant Type-American	2.699	5.362	0.503	0.617	-8.123	13.520
Restaurant Type-Asian	-9.896	5.673	-1.744	**0.088**	-21.345	1.553
Restaurant Type-Italian	0.166	6.084	0.027	0.978	-12.111	12.443
Restaurant Type-Mexican	3.411	7.071	0.482	0.632	-10.859	17.681
Restaurant Type-other	0.000	0.000				
COVID-19 Updates Services(yelp)	-8.073	4.984	-1.620	**0.113**	-18.130	1.985

Model A-3: The relations between independent variables and health score.

Goodness of fit statistics (Health Score):

Observations	59
Sum of weights	59
DF	51
R²	0.314
Adjusted R²	0.220
MSE	54.330
RMSE	7.371
MAPE	5.517
DW	1.688
Cp	8.000
AIC	243.112
SBC	259.733
PC	0.901

Analysis of variance (Health Score):

Source	DF	Sum of squares	Mean squares	F	Pr > F
Model	7	1270.801	181.543	3.341	0.005
Error	51	2770.826	54.330		
Corrected Total	58	4041.627			

Computed against model Y=Mean(Y)

Model parameters (Health Score):

Source	Value	Standard error	t	Pr > |t|	Lower bound	Upper bound
Intercept	111.321	5.121	21.739	<0.0001	101.040	121.601
Claimed	-4.377	2.469	-1.773	0.082	-9.334	0.579
Website Design Score	-1.451	0.549	-2.640	0.011	-2.554	-0.348
Restaurant Type-American	1.890	3.935	0.480	0.633	-6.010	9.790
Restaurant Type-Asian	-10.430	3.881	-2.687	0.010	-18.222	-2.639
Restaurant Type-Italian	-1.018	4.358	-0.234	0.816	-9.767	7.731
Restaurant Type-Mexican	1.835	5.346	0.343	0.733	-8.898	12.567
Restaurant Type-other	0.000	0.000				
COVID-19 Updates Services(yelp)	-8.166	3.671	-2.224	0.031	-15.536	-0.795

Model A-4: The relations between independent variables and health score after removing the insignificant independent variables in Model A-3. Note that Model A-4 is the same as Model 2 in this manuscript.