Analysing the Preparedness of Auckland Businesses for Global Changes in Business Processes

Introduction

Auckland is the main commercial and corporate hub of New Zealand, hence the Auckland Council, in conjunction with government councils in adjacent regions and other developmental partners, aim to provide and maintain modern infrastructure throughout the region.

This objective is to support the growth of businesses, which is the main source of employment to the rest of the Nation's population, directly or indirectly. However, the council also recognises that entrepreneurs must be able to take advantage of these modern infrastructure to engage in vibrant business activities, hence it also provides information directed at achieving this aim. This is done mainly through various Auckland Council Development Plans, which are publicly available.

Problem

The first Greater Auckland Plan, produced in 2012, mentioned providing various forms of support to Auckland businesses towards large-scale adoption of modern business operation tools. Examples of these tools are multimedia websites, online market portals and e-commerce platforms. These need high-speed internet service roll-out, which the Council has been actively supporting.

Despite the reiteration of this commitment to providing the required infrastructure and planning support to local businesses in the latest version of the planning document, the Auckland Plan 2050, a basic check of many business directories, online or offline, shows that many businesses do not have a cyberspace presence and hence are not doing their part in taking advantage of these internet services. Also, at the time the Auckland Plan 2050 was being drafted, there were no obvious signs that a global pandemic would shortly occur, but it clearly expresses the need for businesses to obtain a presence in the cyberspace. Currently, COVID-19 has devastated many businesses, with numerous jobs lost. Businesses are now scrambling to adapt to the requirements for safe operations, which involve figuring out how to keep their staff and patrons safe while still turning a profit.

This project mainly seeks to investigate how well Auckland businesses are adapting to the COVID-19 pandemic, by analysing the presence of these businesses in the cyberspace. Other objectives also exist, which will be described in the next Section.

Background

Obtaining cyberspace presence for businesses involves developing customised static or interactive websites, creating free profiles in generalised web platforms such as Facebook, Instagram, Snapchat, or using paid marketplace platforms such as TradeMe and Mallplanet. The URL (Uniform Resource Locator) of such web platforms are then widely disseminated in offline directories such as NZ Post Yellow Pages and online directories such as The Heart of The City, where internet users can find these businesses and access the information contained on their websites. This project will carry out four basic checks of these URLs:

1. The existence of a URL.
2. The availability of the website through the URL.

3. The provision of critical information tangential to adequate patronage of the business. Due to the COVID-19 pandemic, a check of the availability of COVID information on the website's home page will be the only check carried out.

In addition, the project will carry out a general assessment of the various businesses operating in Auckland, specifically within the CBD. The locations of the businesses will be mapped using longitude and latitude coordinates, and the level of activity/popularity of businesses around selected locations which have pedestrian counters will also be investigated using Foursquare Location Data. Relationships between these factors will be established with a view to show that businesses without adequate cyberspace presence may experience significant problems staying viable, even in the anticipated post-COVID era, due to major and somewhat permanent shifts in worldwide business operation standards and etiquettes.

Data Source and Operations

The primary data for the project will come from a popular Auckland CBD online business directory, which is directly subscribed to by the businesses themselves i.e. they provide the information themselves. The directory will be web-scraped for the following information: Name, Street Address, Main Category, Sub Category 1, Sub Category 2, Business Precinct within the CBD, and Web URL. The providers of the directory also provide pedestrian data for popular locations within the CBD, which is downloadable as Excel files.

The Street Address will be processed to obtain coordinates for the purpose of using map visualizations. The Precinct and Categories for the businesses will be used to cluster the businesses based on the most popular categories of businesses within each Precinct. The URL will be processed by using automated web testing tools to determine how well the business is maintaining a cyber presence, as described in the Background Section.

Although the main data visualization will be via maps, other visualization tools, specifically charts and bar graphs, will also be used to demonstrate the interactions between the various factors under consideration. The pedestrian data will be visualized primarily using bar graphs and charts. Also, a simple regression will also be performed to predict the pedestrian data for the rest of the year 2020, based on the known 2019 data and impact of the COVID-19 pandemic during the early part of 2020. This predicted pedestrian data will form the basis for further encouragement to businesses who previously were not inclined to create a strong cyber presence, to do so.

Methodology

An analysis of businesses in any area is carried out for various reasons, such as determining the best location to open a new outlet based on proximity to competitors and allied businesses, logistic routes, and so on. However, the world is currently experiencing a pandemic, and so it is a good idea to investigate how businesses are adapting to the effect of movement and physical interaction restrictions put in place to manage the spread of COVID-19, in order to gauge their performance.

One obvious way that businesses are tackling the situation is to migrate as much of their business operations to the cyberspace as possible. Hence, a good place to start is to go where a large pool of product or service information is available on short call: online business directories.

The primary data used for this project is obtained from a popular Auckland CBD business association's website, Heart of the City. It is one of the best online sources of information tailored to support enterprise in the CBD, including pedestrian data. It was determined that the fastest way to obtain this data was to download it where available, or web-scape it where it isn't. The following steps describe the processes used in executing this project.

1. Data acquisition – The CBD business directory information was web scraped using Beautifulsoup and Selenium. The Python code is contained in 'Web_Scraper.ipynb'. Note that due to the necessity to prevent indiscriminate scraping of the data source website, which is tangential to real-time e-commerce, the working code will not be publicly published. Hence, this file contains only pointers and semi-accurate code, but it can be examined for structure and syntax conformity. The data from this task is available in 'web_scraper.xlsx'.

   The first page of the directory is set as the initial URL, and subsequent pages are automatically selected via the code, which also includes a html text data extraction loop.
   The pedestrian data information was downloaded from the same website as an .xlsx file and was manually processed to include location data. This was easy as there are only 19 counter locations. The results of this task are available in 'ped_counter_locations.xlsx'.

2. Data Wrangling and Pre-processing – The home pages of the URLs provided in the directory were word-scraped for the case-insensitive key phrases 'covid', 'contact tracing' and 'qr', using the code contained in 'URL_COVID_Classifier.ipynb'. This was to determine to what extent businesses update their websites with current and important information for the benefit of their clients. The process is similar to that used in acquiring the directory data. The results of the tests were added to the existing data as a new column and saved in 'url_covid_classifier.xlsx'.

   The next step was to use the street address information provided in the directory to obtain latitude and longitude coordinates from the 'geolocator' package, using the code contained in 'Address_to_Lat_Lon.ipynb'. The results of this task are available in 'address_to_lat_lon.xlsx' as two new columns.

   The information processed so far was then used to create map visualizations using Folium and Python code contained in 'Map_Visualization_Preprocessor.ipynb'. The initial result of this process was stored in 'map_visualization_preprocessor.xlsx', however despite the accuracy of the code, the screenshot in Figure 1 below shows that some locations were placed far outside the CBD area in the map.
   This, and other data handling problems encountered in this project, were mainly due to inaccurate data entered into the directory, which was determined to be the sole responsibility of the directory subscribers i.e. the businesses themselves. These errors in address input were solved by manual data cleaning of 'address_to_lat_lon.xlsx', as there were only seven such outliers. Hence, the working file for this step is 'address_to_lat_lon_Cleaned.xlsx'.

   A geofencing code snippet was applied to verify that only those locations within 1.5 km radius of the city centre will be retailed. Hence, about 0.5% of the original directory entries were deleted, however two outliers were retained due to their importance to the directory dataset. These can be viewed (but not selected) in the geofenced map. The final verified directory data, including corrected map coordinates, is saved in 'map_visualization_preprocessor.xlsx'

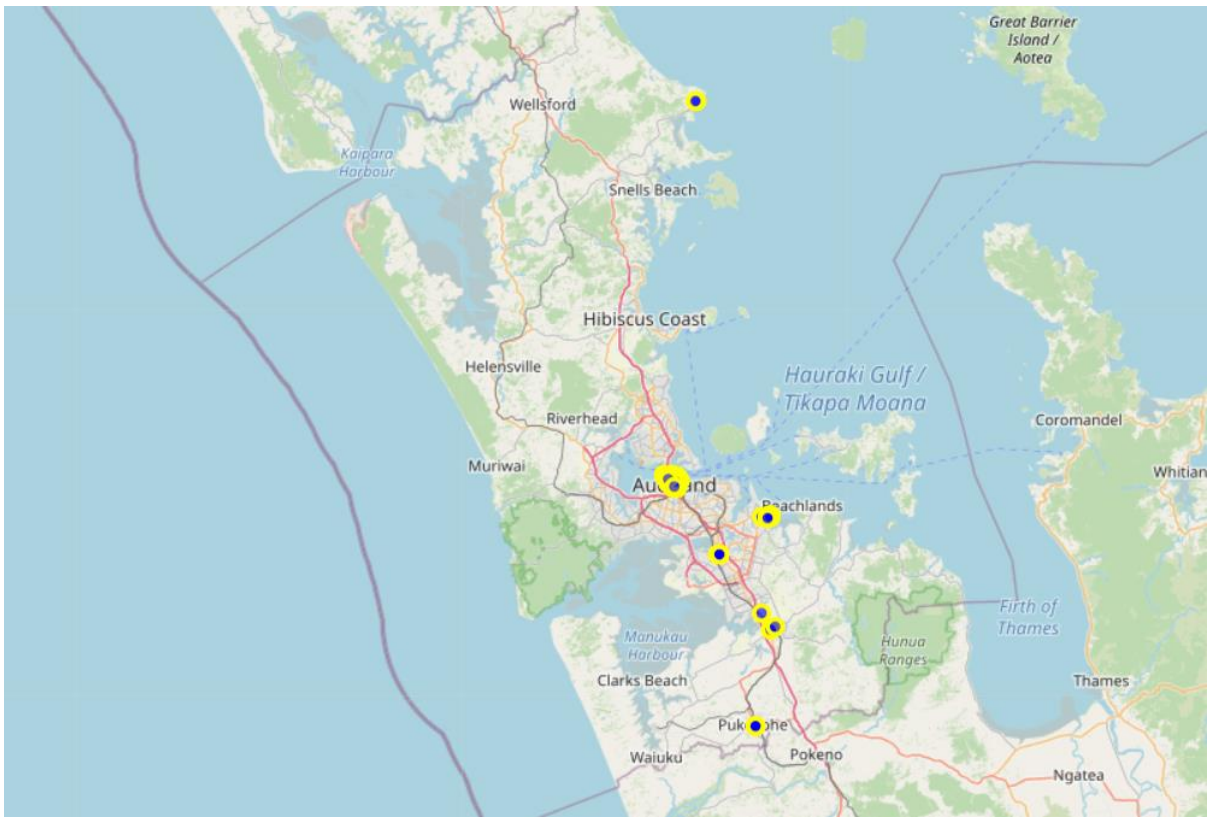

Figure 1 – Screenshot of initial map visualization of CBD Business Locations

3. Data Analysis – The analysis of Auckland CBD businesses to the COVID-19 pandemic is carried out with code in 'Auckland_CBD_Segmentation.ipynb'. The data required for this task is contained in 'map_visualization_preprocessor.xlsx' and 'ped_counter_locations.xlsx'.

   First, hyperlinked labels for each location icon to be used on the map were created from the available data, enabling the URL provided by the business to be accessed by clicking on the icon. The first map that was created had all the icons displayed in very close proximity to each other, giving the map an untidy look and making it difficult to narrow down to specific icons, hence the 'MarkerCluster' plugin was utilized to cluster the location icons, controlled by the map zoom level.

   Then, the pedestrian counter locations were added to the map in a separate colour to aid in proper visualization. The icons for these locations were also primed to show the top three popular locations within 100m radius of each location, viewable on icon click. This information was obtained using Foursquare Location Data GET requests service, on a free developer account. For this reason, each user of this code must specify their own personal Foursquare developer account details, as none was provided for obvious reasons.

   Next, the number of distinct business categories listed in the directory was determined by one-hot encoding and grouped by the city Precincts in which the businesses are located. Then, the mean of the frequency of occurrence of each category was calculated. Following this, the top five most common categories per Precinct were determined.

   The directory lists 10 Precincts, hence a k-Means Clustering algorithm was applied to the category data to cluster the Precincts themselves, based on the most popular categories earlier determined. Five clusters were specified, and the results clearly showed that each of those five clusters had similarities. These similarities will be explained in the next Section.

Results

1. Data Interpretation – The analysis of the previous Section identified 82 distinct categories of businesses in the CBD, from 2,068 individual businesses considered, which roughly translates to 25 businesses per category.

   The CBD area under consideration is 7 km2 from a radius of 1.5km. This means that in each square kilometre, there are roughly 3.6 businesses that engage in the same distinct business.

   The analysis also revealed that Auckland CBD's Precincts have similarities based on the most popular business activities that take place in each of them. These most popular activities provide the opportunity to classify these Precincts and properly associate them with specific business functions. There have been a number of efforts to identify specific business activities that go on in these precincts, but this analysis can be seen to be based purely on the information provided by the business owners/operators themselves, who are the best suited to accurately determine what line of business they engage in.

   Hence, the following business activities occur in the following Auckland CBD Precincts, and may be considered as an alternative method of segmenting the CBD if so desired.

   i - 'Legal and Fashion District' – Consists of the Fort Street area and High Street District Precincts.

   ii - 'Central Restaurant and Cafe District' – Consists of the Aotea Arts Quarter Precinct.

   Iii - 'Financial and Business/Consulting District' – Consists of the Britomart, Federal & Elliott, Queen Street, Viaduct & Waterfront, and Victoria Quarter Precincts.

   iv - 'Health and Wellbeing Services District' – Consists of the City Works Depot Precinct.

   v - 'Wynyard Quarter Restaurant and Cafe District' – As the name implies, consists of the Wynyard Quarter Precinct.

2. Data Visualization – These results, along with the rest of the results of the analysis such as the prevalence of absent or expired web URLs in the Auckland CBD directory and popular venues within walking distance of each pedestrian counter location, can be viewed directly on the final map which has been provided along with the other files described in this report. Apart from the regular zoom clustering previously described, this map is layered in accordance with each identified cluster, to further aid in easy viewing.

Discussion

Although a few businesses may not be market-vigilant under normal local and global conditions due to several factors on their part, It is interesting to note that despite the efforts by New Zealand government authorities and global interested stakeholders, several business owners/operators are not sensitive enough to their client needs and expectations. The main priority for businesses should be to provide detailed, accurate, relevant and up-to-date information about as many aspects of their business as possible. This will make them easy to find and be provided the patronage that is vital for sustainability. This is especially true if that information is accessible on the internet, which is arguably the best tool for business growth.

However, operating a website or webpage without the conscious effort to provide dynamic information is also not helpful to any business, as this project has shown. The COVID-19 pandemic

reared its ugly head in New Zealand at the beginning of March 2000, and at the time of writing this report five months later, quite a number of businesses still do not consider it important to post any COVID-19 safety information on their websites. This situation is not ideal, particularly for businesses such as restaurants and beauty services that clearly depend on physical presence of patrons at their locations. It will be interesting to note that many people simply avoid going to places that have not provided clear information on how the intend to keep patrons safe in their premises.

It will also be interesting to note that some businesses located in the CBD have provided the wrong street addresses for their locations. Official location addresses, as specified by the Council and other government authorities, are usually the ones that location data providers such as Google Maps use. Hence, a wrong street address input in a business directory may translate to revenue loss for that business. Other wrong data inputs such as phone number will most probably have the same effect.

On a positive note, Auckland CBD has a good business terrain, based on the wide array of business activities going on. The location density for unique businesses is very low, indicating that requirements for competition is positive and most welcome. Many businesses involved in providing services that require being in close proximity to patrons have also done wonderful jobs of providing clear and concise COVID-19 safety information matching the various levels of lockdown to date. Shout out to Baduzzi Italian Restaurant and others that dedicated entire pages of their website for this purpose.

Conclusion

The cyberspace, which consists of webpages, e-commerce sites and various cloud services, is one of the best things to happen to any field of human endeavour, particularly business. These tools are readily available in New Zealand, and so is the expertise and know-how required to bring the best out of businesses, such as software programming and Data Science. All that is required is for business owners/operators to recognise the huge potential these tools have to transform their businesses into profitable entities, even with the COVID-19 pandemic still around.

As has been so far observed by many people, the pandemic has triggered a shift in paradigm with respect to protocols of conducting business, and hence we all really do not have much of a choice but to create digital versions of ourselves and/or our businesses, particularly for the purpose of sustainability of livelihoods. Hence, as Auckland represents much of what occurs in the rest of the country as far as business is concerned, it will be imperative for all business owners to be more vigilant in creating and maintaining a presence in the cyberspace.