

# **Report for Applied Data Science Capstone Project**

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### **Business Problem:**

For this capstone project, I will first do research on what kind of locations are favored by coworking companies in Greater Washington DC Metro area by exploring surrounding attributes of several existing CoWorking spaces (mainly WeWork and Industrious coworking spaces). More specifically, location attributes I will analyze include richness and diversity of amenities such as restaurants, cafes, shopping malls, delivery services, grocery stores and supermarkets, fitness centers, haircut services and so on, public transit accessibility (number of subway stations or bus stops within walking distance from the coworking location, average housing rent, and number of office buildings. Using quantitative measures of these location attributes, I will extract key features shared by these D.C coworking locations. In other words, whether surrounding area of a coworking location exhibits a above-average level in certain location attributes. Results from this part of study provides some evidence for what defines a good coworking location in D.C metro area and some insights into coworking companies' location selection process.

For the second part, I conduct literature review on existing coworking papers to collect a list of common location characteristics of coworking locations. Finally, I will combine favorable location attributes suggested by existing literature and those I find in the first part to derive a location selection criteria for coworking spaces in D.C metro area. Finally, I will recommend neighborhoods or districts are ideal locations for new coworking spaces to open in D.C metro area based on this selection criteria.

### **Who will be interested in this project**

Some stakeholders will be interested in this project. Coworking companies which plan to enter or expand in D.C market may have strongest interests. Research findings from this project can simplify their market research and field investigation process by giving them a smaller set of desirable locations for choice. And then some financial and human costs can be saved. And a good coworking location can lead to lower vacancy rate and quicker leasing process. Real estate consulting firms should also have strong interests in this project. Some large coworking companies will hire real estate consulting firms to identify good locations. With the rapid development of the coworking industry, coworking companies have become an increasingly important customer for real estate consulting firms. Research findings from this project could help create business value for these consulting firms. Companies, especially startups, which want to become a coworking tenant, will also be interested in this project. They can use selection criteria created by this project to evaluate which coworking location is a good one. Academic researchers on urban and real estate economics may also be interested in this project.

### **Background**

Coworking industry has been growing rapidly during recent years. Numerous cowering space providers emerge across the country. This industry starts to play a transformative role in the real estate industry. An increasingly number of real estate developers or investment trust are involved into the coworking development.

In the U.S market, WeWork, Regus, and Industrious are three leading cowering companies. Metropolis such as New York City, Los Angeles, Chicago, Boston have become a coworking cluster. However, Washington DC metro area has not experienced a significant coworking development. Since Amazon will place its HQ2 in Crystal city, D.C business market exhibits a great potential for coworking development. As the national capital, DC has a very different urban planning pattern and industrial structure from other large U.S cities. It is meaningful to explore current coworking development in D.C and identify desirable future cowering locations.

### **Data**

Data used in this project will be from four different sources. The first data source is FourSquare location data. This data source will provide information about richness and diversity of amenities. More specifically, this data set contains the number of restaurants, cafes, shopping malls, delivery services, grocery stores and supermarkets, fitness centers, haircut services, and sports bar and so on within a certain walking distance from a specified coworking location. Raw data from FourSquare only contains one record for each venue which meet all requirements in the search query. Then I collapse the raw data by group variables such as venue categories to generate aggregated measures such as number of amenities within this category and diversity of a certain type of amenity. One example of the diversity measure is number of cuisine types (Asian, American, Italian etc.) for restaurants near a coworking location. I will group the raw restaurant data by cuisine type and count number of types, as well as restaurants falling within each cuisine type. The second data source is measures of public transit accessibility. More specifically, number of bus stops and number of subway stations near a cowering location will be collected. I collect these two measurements from Google Map.

### **Methodology**

The methodology used in this project is very straightforward. I firstly select three representative coworking locations for WeWork and Regus respectively in Great Washington DC area (mainly including DC and Arlington). Then I use Google map to geocode each cowering location based on their address. For each coworking location, I use FourSquare API to get data about its nearby venues (up to 100) within 500 meters from the coworking space. After that, I group all venues meeting requirements in the search query by their venue category and then sort the results in descending order. The purpose of this step is to see which kinds of venues are most common to see near a coworking location and the diversity of amenity nearby. By examining nearby venues for each coworking space selected, I can get a basic understanding of typical amenity information near a coworking location. In other words, what kind of area is a desirable location for cowering space.

After collecting and analyzing nearby venue information, I use Google map to get the number of subway stations and bus stops within the walking distance from a cowering location. For subway station, I use less than or equal to 11 minutes' walking time from the cowering location as search criteria. For bus stops, I use less than or equal to 6 minutes' walking time as the search criteria. These two variables can measure the public transit accessibility of a coworking location.

Through these two steps, I quantify two important built environment factors of a coworking location: richness and diversity of amenity and public transit accessibility. Finally, I conduct literature review to collect typical location attributed for a coworking space and combine quantified measures above to derive cowering location selection criteria in Great Washington DC area.

## **Results**

### **WeWork location at 1701 Rhode Island Ave NW, Washington, DC**

Hotel and Coffee shop are two top venues near WeWork at Rhode Island avenue. There are 7 hotels and 5 coffee shops within 500 meters from this space, as well as 4 sandwich places and 3 cafes. Mediterranean seems to be the most common cuisine type in the surroundings. This coworking location has relatively good public transit accessibility with 2 subway stations within 11 minutes' walking distance and 9 bus stops within 6 minutes' walking distance.

### **WeWork location at 901 North Glebe Road, Arlington, VA**

Overall speaking, the diversity and richness of amenities are lower around this location compared to other coworking locations selected in this project. Coffee shop becomes the No.1 venue category around the WeWork's Arlington location. There are 6 coffee shops within 500 meters from this space. A limited number of fast food restaurants such as sandwich stores or pizza spaces are near this location. But there are 3 food trucks for lunch. The density of food trucks is significantly higher in this area. American restaurants is the dominant cuisine type near this area and the cuisine diversity is weak. Hotel density is low near this cowering location. This coworking location has relatively good public transit accessibility with 2 subway stations within 11 minutes' walking distance and 8 bus stops within 6 minutes' walking distance.

### **WeWork location at 700 K street NW, Washington, DC**

Venues near this WeWork location are kind of unique. Restaurant is the most common amenity category within 500 meters from this location. Availability of food is very good near this location. American, Italian and Ramen are three most popular cuisine types. Hotel is the second most common venue category. There are three sandwich stores and 3 pizza places near this coworking space, providing a convenient place to have lunch for cowering tenants. But coffee shops are not very common near this space, indicating insufficient space for informal business talks and networking chats near this coworking location. This coworking location has very good

public transit accessibility with 5 subway stations within 11 minutes' walking distance and 9 bus stops within 6 minutes' walking distance. Coworking tenants can easily and efficiently travel by public transportation from and to this location.

#### **Regus location at 1655 NORTH FORT MYER DRIVE, SUITE 700, ARLINGTON, VIRGINIA**

Coffee shop and restaurants are top two venues near this Regus location in Arlington. American and Italian are two most common cuisine types nearby. Fast food places such as sandwich and pizza places have low density here. Hotel is not even listed as a common venue category here. Some amenities with limited supporting role to business activities such as clothing store and cosmetics shop cluster in the surroundings of this space. This coworking location has average public transit accessibility with only 1 subway station within 11 minutes' walking distance and 9 bus stops within 6 minutes' walking distance. Since traveling by bus is far less convenient than traveling by subway, the lack of subway stations nearby may cost much more commuting time and daily transit costs for coworking tenants.

#### **Regus location at 1441 L ST NW, Washington, DC**

Areas near this Regus location at One Thomas circle at 14th street is featured with a cluster of hotels. There are 15 hotels near this coworking space, almost triple of the number near other locations. Additionally, there are sufficient number of coffee places for business chat and networking near this location. We also observe a sufficient number of fast food places such as food trucks and sandwich places there. There are not many formal restaurants near this location and the most popular cuisine type is American and Japanese.

#### **Regus location at 1000 POTOMAC STREET NW, Washington, DC**

Amenities near this Regus location at Georgetown is very similar to those near WeWork location in Arlington. Coffee shops and restaurants are top venues. Hotels and fast food places have low density here. After-hour destinations such as clothing store, women's store and dessert places are sufficient there. There are no subway stations near Georgetown because of resistance from local communities, resulting in 0 subway stations within 11 minutes' walk from this location and 7 bus stops nearby. This place has very low public transit accessibility. However, locating near local best university may compensate this disadvantage in the location selection process.

#### **Discussion**

Results above tell us top venues information each coworking selected. I only keep venue category which has at least 3 locations within 500 meters from the coworking location. We can find that each coworking location has a very diversified base of amenities nearby. Hotels, coffee shops, and American restaurants are most common venues near a coworking location. Coffee shops are good choices for coworking tenants in networking, informal business meeting and team discussion etc. So it is reasonable that many coffee shops nearby enhance the

attractiveness of a coworking location. Hotels is for business trip and restaurants is for business dinner, both of which provide necessary functions for daily business activities and recreation. In terms of the cuisine type, American restaurants, Italian restaurants and Sushi bars are most typical restaurant types near a coworking location.

It is worth noticing that besides formal restaurants, fast food places such as sandwich stores, bakery, food truck and pizza places are also among top venues around a coworking location. These food facilities well enable coworking tenants, especially those entrepreneurs and freelancers, to have a quick and cheap breakfast or lunch conveniently. Good accessibility to fast food is also a desirable characteristic of the surroundings of a coworking location.

After analyzing top venues near a coworking location, I conduct literature review on local attributes of a coworking space. Limited empirical research is done in this field but some existing studies provide meaningful implications to capture the pattern of site choice. Weijs-Perree, M. et.al (2019) analyzed user preferences for coworking spaces and found that a workspace with inspiring environment and affordable accommodation attracted people. Also, results from a mixed-multinomial logit model show that accessibility and atmosphere/interior are most important considerations in the site choice. More specifically, accessibility to car and public transit, a semi-open layout and a homelike interior appeal to coworking space users' preference. Capdevila (2013) found that a coworking space closer to residential districts or near a more central and accessible location is preferred by users. Remoy and Van der Voordt (2014) also emphasized the importance of accessibility of the location by public transit, bicycle and car. However, their empirical findings deny the significant effects from facilities/services such as reception and hospitality, events and diversity in supply spaces although these factors are viewed to help enhance the sense of community in coworking spaces. (Fuiz, 2015) found that a building having a combination of open and closed workspaces for various functions is a good choice for coworking space. The mix of both standard and coworking spaces is desirable. Because such interior design is expected to reduce noise and protect privacy for workers. Sykes (2014) informal meeting and event spaces in the building can add value to coworking spaces. But their research findings also show that some premium facilities such as bar and fitness centers are not valued by coworking space workers. Merkel(2015) and Capdevila (2013) find more parking spaces will facilitate the coworking space site decision.

Kojo, I. & Nenonen, S. (2016) summarized 6 coworking space typologies: public offices, third places, collaboration hubs, coworking hotels, incubators and shared studios. Mariotti, I. et.al (2017) examined the coworking spaces' location patterns and effects on urban form in Milan. Their observations demonstrate three location determinants for coworking spaces: the high density of business activities, the proximity to universities and research institutions, and the accessibility to a good local public transportation network. Additionally, coworking spaces in Milan are usually located in areas far away from the city center to secure low rents and enough vacant space. Neighborhoods with a higher proportion of immigrants and communities with many former industrial or commercial buildings usually have a larger number of coworking spaces.

**Conclusion:**

This project employs the FourSquare API and Google Map to quantify two important built environment factors near 6 selected WeWork and Regus coworking spaces: richness and diversity of nearby venues and public transit accessibility. Coffee shop, hotel and restaurants are three top venues near a coworking location. These three amenity categories provide necessary functions and supporting role to business working in coworking spaces. Public transit accessibility is an important consideration factor in selecting coworking locations. A location with many subway stations or bus stops can effectively reduce coworking tenants' daily commuting time and costs and gives them a wide range of affordable housing options, all of which are valued by entrepreneurs in the coworking space. Being close to local universities could sometimes compensate the weakness in transit accessibility. According to literature review, proximity from facilities/services such as reception and hospitality, the high density of business activities, the proximity to universities and research institutions, and the accessibility to a good local public transportation network are key considerations in targeting a desirable coworking location. Findings from my research and literature review creates a set of selection criteria for potential coworking locations in Greater Washington DC area. Based on this criteria, Wisconsin avenue near Cleveland Park subway station, M street near Foggy Bottom subway station, Logan circle, and places near Fashion center at Pentagon Row are good future choices for new coworking spaces in DC area.