A CORRELATION ANALYSIS OF AMENITIES AND PRICE FROM COWORKING OFFICES IN EUROPE

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Abstract

The purpose of this paper is to examine the concept of coworking on the basis analyzing amenities and price data from coworking offices. Coworking spaces providing more flexible working style, diverse member to interact. Although coworking is a hot topic there is still few empirical research that discusses the actual conditions of coworking spaces in Europe. I attempt to have a deeper insight of amenities and prices of coworking using a dataset collected with web crawlers.

Key words:

Coworking; Coworker; Coworking space; Web crawler.

INTRODUCTION

The purpose of this paper is to examine the concept of coworking on the basis analyzing amenities data from coworking offices. Specifically, I created a web crawler robot to collect data online from Sharedesk.net[1] (in 2015), parse it, store it into a database and show the result of the correlation analysis relating to the detailed items.

Personal computing allowed white collar work to leave the workshop (Spinuzzi, 2012), but working alone removed the possibility to access better infrastructure, connect and network with other people. This lead to cowork and coworking, Gandini (2015, 194) defines as "Coworking spaces are shared workplaces utilized by different

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[1] This is a webpage where people can meet desks at coworking spaces. It was created by Enrico Icardi, Kia Rahmani and Dario Aschero in 2009, to connect spaces and members. Enrico had the experience and a motivation to create this kind of site, because he was travelling back and forth between Torino and Berlin and he needed a place where he could work on his freelancing projects. The site is free to use, only after a successful meeting there is a commission of 15% for the desk owners.

sorts of knowledge professionals, mostly freelancers, working in various degrees of specialization in the vast domain of the knowledge industry."

Coworking spaces spreading in many countries, there are 19,000 worldwide (Foertsch, 2018) today, and 29% of all coworking spaces were opened over the last year. A coworking space today is serving 83 members and 23% of the coworking spaces has more than 150 members. This shows us that the flexible working style and new way of working is a hot topic, however the number of member and the number of spaces is insufficient to describe this phenomenon. This paper dives deeper of the attributes of a coworking space, what amenities are offered by coworking spaces to attract members.

The paper from the next section comprises the following structure. In Section 2, the phenomenon of coworking is overviewed; in Section 3 explains the method used in this paper. Section 4 describes the results of a correlation analysis of the dataset using the web crawling method described in Section 3. Section 5 summarizes the discussion, presents the significance of this paper, and suggests future research issues.

PHENOMENON OF COWORKING

The first step to the coworking concept was the hackerspace (Foertsch & Cagnol, 2013), in 1995 the German Chaos Computer Club (CCC) created "c-base", where computer professionals could met, work together and build a community. Meanwhile in New York under the name of 42 West 24 opened an office where people could rent desks for short term. Coworking and coworking spaces mixed these two ideas, short term rent and community building for creative people, in 2005 a freelance engineer called Brad Neuberg, who had enough working alone from home and opened a place at Spiral Muse in San Francisco to work with his friends (BCNewt, 2015). Actually it was not a commercial success, however ten years later, according my crawling to Sharedesk.net, in San Francisco there were 86 coworking offices, 1255 in the whole USA.

One of the factor of this success was the transformation of work. The 1980s' office (Laing, 1991) or the Fordist office limitations, like the nine- to five-day are not supporting the knowledge economy. Creative ideas are not born between walls or command, you need space and freedom.

Another factor was that the digital transformation supports the flexible work (Moriset, 2013). Creative people nowadays working using laptops and tablet, they transmit their data, reach their desktop through wireless network. The creativity and the technology gave freedom to the worker, removed the fix structure, satisfied the needs for non-uniform time use. The main issue was that people (digital nomads) felt themselves alone (Kenline, 2012). Coworking spaces solved this. They offered office infrastructure (like scanner, printers, internet, Wi-Fi, fax, meeting rooms) and creating community for the members. Aguiton and Cardon (2007) discovered, such week ties improve

innovation. Lange (2011) founded that 'scene knowledge' become increasingly relevant for entrepreneurial practices.

Thus, the phenomenon of coworking and coworking space is steadily spreading not only in the United States. There are coworking offices in the big cities of Europe. Unlike this big growing that is happening in this economical market there are only few studies about coworking and even fewer studies that focus on condition of coworking spaces.

Spinuzzi (2012) made a 2-year study of coworking at nine coworking spaces in Austin. His research questions were coworking spaces membership fees what services are in the practice and how they describe that service, the finding was that coworking offices want to create a "creative, functional and affordable workplace community" (Spinuzzi, 2012: 412).
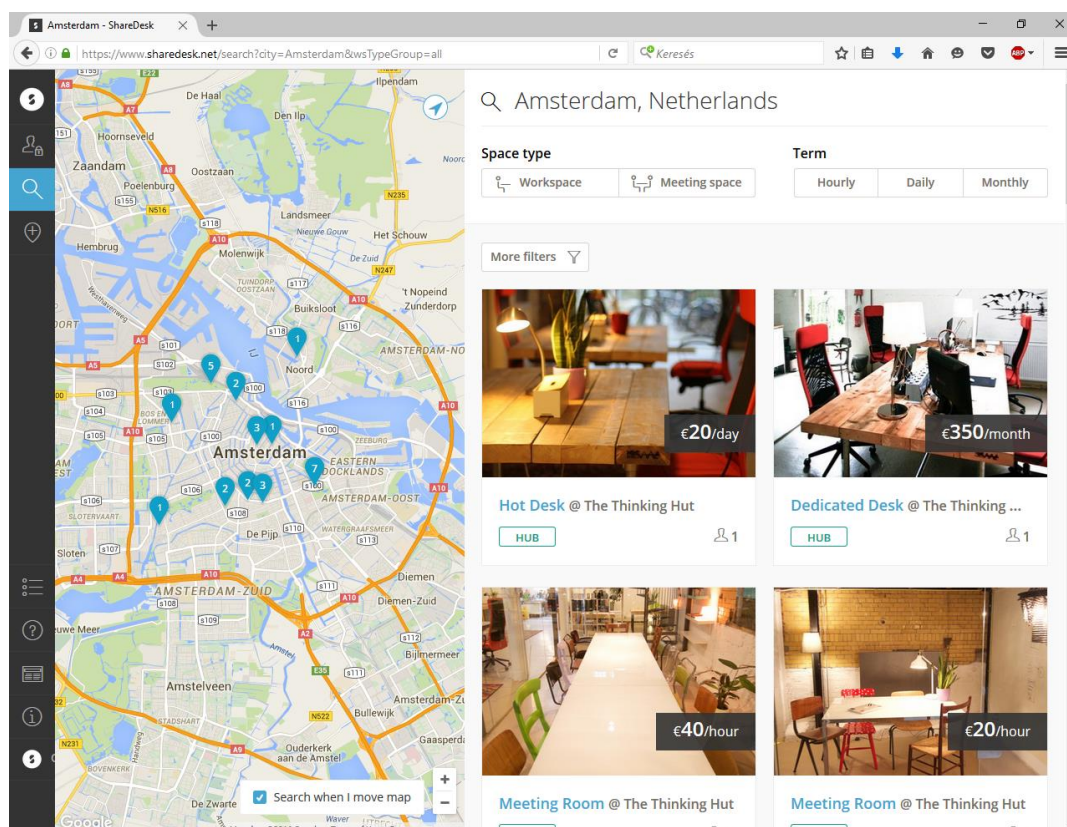
RESEARCH METHOD

FIGURE 1. SHAREDESK MAIN SCREEN

Any content that can be viewed on a webpage can be scraped, so the dataset used in this paper is based on data obtained from coworking spaces using web crawlers. Scrapy is an open source Python framework made for large scale web scraping. Websites are diverse so there was no ready to use solution, so it needed time and ad hoc approaches how to create the dataset for the research.

The main idea was to create two web spiders: one that extracts the urls for the crawling and another for the invidual webpages. However, the main screen of Sharedesk.net (Figure 1.) contains all the coworking offices in the area, but the area is limited isn't possible to zoom out to see the whole world. So I needed to think differently to get the individual webpages. In the url is www.sharedesk.net/search?city= so there will be possible to add city names from a dictionary but it sounded complicated.
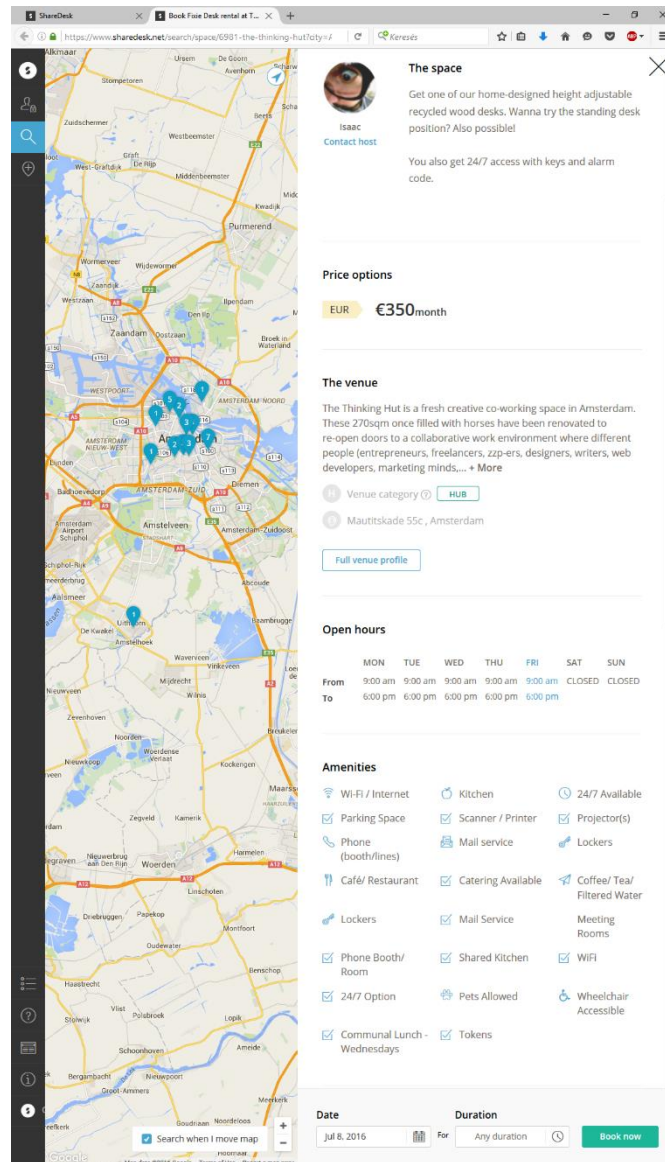

FIGURE 2. WEBPAGE OF A COWORKING OFFICE ON THE SHAREDESK.NET SITE

If I clicked on an item I saw that the url changed like this: https://www.sharedesk.net/search/space/6983-the-thinkinghut?city=amsterdam&ws TypeGroup=all and this gave me the idea, why not to check is there an unique ID for the venues. It worked so I created a url generator script instead the first web crawler, which created the url with growing id number from 0 to 10,000 in a csv file. According the computer processing capacity, it was no issue to have this number and it was quicker, if an ID is no longer used there will be a 404 page, which I removed during

the processing from the extract file.

I made the real web crawler really simply, it red the csv file with the urls and extracted a JSON code from the webpages. The web crawling was conducted in 2015 summer. It took two days to finished, because I used artificial delay between two webpage requests, to avoid IP address banning for Denial of Service (DoS) attack.

TABLE 1. DATASET

Items	
Social media	• The number of Facebook followers • The number of Facebook check-ins • The number of Facebook events • The Facebook review score • The number of Facebook reviewers • Foursquare followers • Foursquare check-ins
Services	• Coworking Visa • Pet friendly • Business services • Community • Community lunch • Open lectures • Catering • Free coffee, tea • Free fruit • Safe • Postal Services
Building	• Wheelchair Accessible • AC • 0-24 • Pong
Hardware	• Wi-Fi • Projector • TV, Monitor • Fax • White table • Scanner, printer
Extra spaces	• Kitchen • Restaurant, Coffee, Bar • Meeting Room • Photo studio • Phone booth • Relaxing rooms • Shower • Parking place • Bicycle parking

The crawled data was heavily processed. First I created a script to change a JSON to

CSV, the header of the table was the keys of the JSON file. It was too big to handle so I used SQLite instead Open Office to store the data in preferred structure and format.

To explore the dataset I used Pandas[2], which is a popular Python package for data science and IPython Notebook[3]. It is so effective, to load the data from the database and create a correlation matrix on the data needs only 5 lines of coding.

To focus on Europe, I took a sample population from the coworking offices from Amsterdam and Budapest, as representing Eastern and Western Europe. I collected extra data manually from social media like Facebook followers, check-ins, event, reviewers, review score and foursquare followers, check-ins. I divided the collected items into five parts: social media items, services, building, hardware, extra spaces. However, Gandini (2015: 194) said "practically conceived as office-renting facilities where workers hire a desk and a Wi-Fi connection these are" if we look in the items from the collected dataset (listed in Table 1) there are much more amenities.

RESULTS

The correlation analysis results are presented below in the order shown in Table 2. The correlation analysis relative to all the other items is not always discussed for every item in each part. Results are described selectively according to the discussion point.

The findings were in the social media part: There were coworking offices without Facebook page, but the highest number of Facebook followers was 6184. The mean for the examined 31 offices were 1211.4. User can check-in in Facebook, if they are visiting a place. Of course if a page is not existing, they could not check-in, so there were 0 check-ins, the maximum value for Facebook check-ins was 1832, the mean was 302.47. The number of Facebook events: With Facebook is possible to organize events, invite users to event. The maximum value was 151, the mean was 20.33. The number of Facebook reviewers maxed in 52 people with the mean of 10.7. with a review score between 0 and 5. Foursquare followers were between 0 and 943 with a mean of 124.97 and the number of check-ins were between 0 and 2602 with a mean of 519.5.

According the correlation matrix all social media item has a positive correlation with other social media item. This means if a venue has a Facebook page, it will have followers, who make check-ins, reviews, participate on events and they used Foursquare too. Only one item was not from the social media, the photo studio. I think the reason for this that if a venue has a place to shoot professional photos, they will use it immediately on social media.

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[2] https://github.com/pandas-dev/pandas
[3] https://ipython.org

TABLE 2. AMENITIES CORRELATION MATRIX

Item 1	Item 2	The significance level of correlation values is 1%
Coworking Visa	AC	1.000
Fax	Relaxing rooms	1.000
Fax	Open lectures	1.000
Relaxing rooms	Open lectures	1.000
Postal services	Catering	0.850
Facebook followers	Facebook check-ins	0.828
Foursquare followers	Foursquare check-ins	0.827
Free coffee, tea	Catering	0.784
Kitchen	Free coffee, tea	0.764
Facebook followers	Facebook events	0.699
Price	Pet friendly	0.697
Pong	Community	0.695
Fax	Community	0.695
Fax	AC	0.695
Relaxing rooms	Community	0.695
Relaxing rooms	AC	0.695
Open lectures	Community	0.695
Open lectures	AC	0.695
Coworking Visa	Fax	0.694
Coworking Visa	Relaxing rooms	0.694
Coworking Visa	Open lectures	0.694
Kitchen	0-24	0.683
Coworking Visa	Wheelchair accessible	0.680
Wheelchair accessible	AC	0.680
Facebook events	Photo studio	0.668
Projector	0-24	0.667
Postal Services	Free coffee, tea	0.667
Facebook check-ins	Facebook events	0.656
Restaurant, coffee, bar	Phone booth	0.630
Restaurant, coffee, bar	Parking place	0.630
Postal services	Phone booth	0.630
Phone booth	Parking place	0.630
Facebook check-ins	Facebook review score	0.621
Facebook followers	Foursquare followers	0.608
Projector	Restaurant, coffee, bar	0.602
Projector	White table	0.602

In the item group services we can find the Coworking Visa, which allows to the digital nomads to use coworking spaces in the whole world. A pet friendly coworking spaces allows members to bring their pet. This is beneficial for the member, because it reduces their stress level ("Manager's Best Friend | The Economist." 2010), petting animals grows oxytocin hormone production (Barker et al., 2012). Improves the relation with other coworkers, the whole milieu is when someone steps in an office and sees instead

people in suits a smiling golden retriever. It is also reducing the negative effect of sitting, and walking improves creative thinking (Oppezzo & Schwartz, 2014). Business services are services to help solve business administrations, postal services to help sending mails and packages. Community means a proactive attitude from the venue owner, to help in creating and organizing a community. Community lunch has the same motivation, team building with eating together and the open lectures too with sharing knowledge between the community members. With empty belly working is less effective catering, free coffee, tea or fruits helps to solve this problem. The last item in the services is the safe, when people could lock their stuff somewhere in the building, so they can leave expensive gear there.

In the correlation matrix Coworking Visa is the most often visible item. According to my understanding if someone want to work somewhere in the world in a coworking office, the office should have a minimum level of amenities. Community and open lectures are also connected to different other items.

The third item group is the "building". In a wheelchair accessible office there are no barriers for people using wheelchair and the signs are written in Braille on the wall or the button for the elevator is low so everybody can reach it. AC is a must have to have fresh, cold and clean air inside the building. Pong is like a ping pong table, to play games. 0-24 means that the building is open night and day. The AC had a strong correlation with other items, as I mentioned it is a must have and buildings of the coworking offices has it.

The fourth group named hardware. Wi-Fi is the most important amenity in a coworking office, wireless internet is a must have. Projector is hardware that projects the screen to a white wall, it is a good to have for presentation, visualize ideas on meetings. White table is the same. TVs, monitors help people to have a screen with bigger and better resolution as their notebook screen has. Scanner and printer are tools for document managing. The most interesting equipment is the last item in this group the fax. However, it is no longer used as sending documents it the most often from this group on the correlation matrix table, because there was only one venue with fax, so it is just a sampling error.

The last item group is the extra space. It is good when a coworking space is a vibrant downtown of a city with cool restaurants, but people like to bring their own food and eat not front of a monitor. To bring this to a next level, some of the venues have their own restaurant, coffee, bar. In a bar you can drink alcohol beverages, so it allows to make program for the community after work. The goal is change ideas instead of getting drunk. Meeting room is also a must have feature of a coworking space, this takes the members life to the next level, if you have meeting room you are no longer a garage company. Photo studio is a space where you can create professional's photos. Phone booth the room where people can speak on their phone without disturbing the others in the office. Relaxing room restores member's energy level after heavy work

session. Shower gives possibility to do some sport during the days and have a fresh shower before sitting back to the desk. The last two item is parking, parking for cars and parking. I made a second correlation analysis with the items and the price (Table 3.).

TABLE 3. PRICE AND AMENITIES CORRELATION MATRIX

Price	Item	The significance level of correlation values is 1%
Price	Pet friendly	0.697
Price	Parking place	0.553
Price	Kitchen	0.525
Price	Meeting room	-.586

This was my main finding, if we do not count the pet friendliness, that price has only effect with extra spaces. If we think about the services, social media it is not about cost, it is about putting effort, work as a host of a coworking space. Hardware and building are something that was a starting investment in a place. Parking place and kitchen has no direct revenue like restaurant, coffee, bar or a photo studio, but it needs extra land or space from a building, which is a huge cost, especially in big cities. However meeting rooms have negative correlation with the price. According to the dataset, more expensive venues did not list meeting room as an amenity, they got in the package already.

CONCLUSION

In this paper, I have performed a correlation analysis to explicate the relationships among the items. Table 3 summarized the major findings of this paper, which has presented the results of a correlation analysis on the operational features of coworking space divided into five groups. According to the dataset amenities are connected with the land needed to include in the price of renting a coworking desks.

Concerning the way of collecting data, one problem is that this study consisted only one aggregating websites data. Better algorithm needed to get more venue data.

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