Digital Marketing: Marketing 549Q

Sentimental Analysis: **WeWork**

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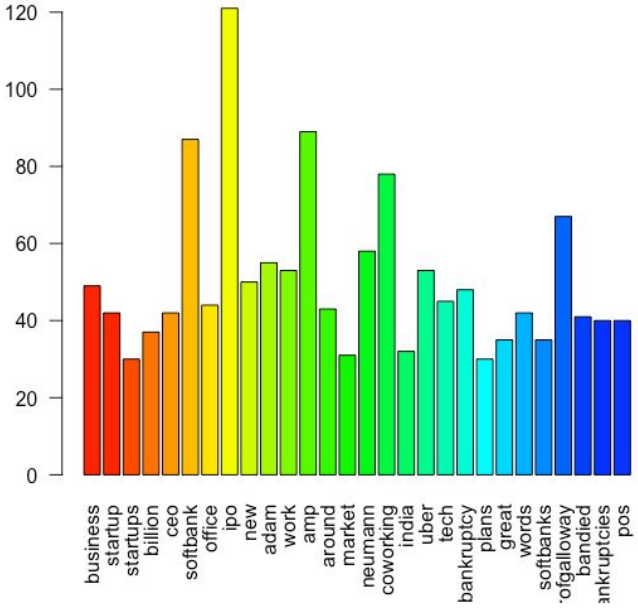
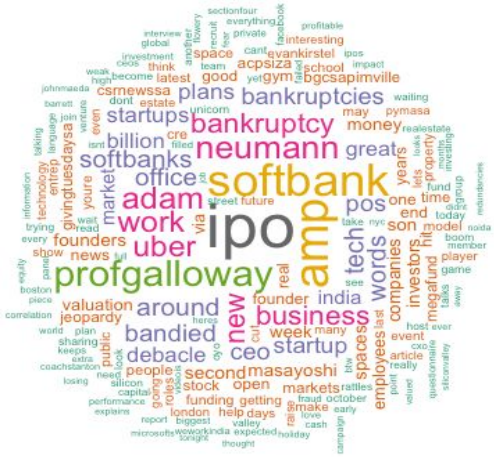
WeWork was founded in 2010 with an idea of providing shared workspaces for technology startups and entrepreneurs and is now known as a global leader in coworking company, having a presence in over 280 locations. In less than 10 years, the company has experienced tremendous growth, expanding to 32 countries. As a Business Insider reporter, Dakin Campbell put it, "WeWork was a unicorn, a near-invincible powerhouse flush with venture capital." Last week, WeWork made the news by going from being valued in $47 billion to talking about filling the bankruptcy in only six weeks. In August, the company filled the paperwork for IPO. As WeWork's financial documents became public, journalists uncovered the massive mismanagement and questionable actions of CEO, Adam Neumann, followed by Morgan Stanley's backing out of WeWork's IPO and the company's valuation plummeting by 70%. Now, the analysts and the public are talking about WeWork's possibility of bankruptcy.1200 tweets were extracted to perform the sentimental analysis and find out how people felt about the recent events surrounding WeWork.

Sentimental Analysis

With the company's plan to go public , and its "unicorn" bubble bursting, the firm is amidst a plethora of reactions that it is receiving. Considering the light of events, it is necessary to observe the net reaction of the people towards the brand, to get better insights about how to reposition the brand and work on its image. The brand can then launch better campaigns, and work with public relationships to enhance/repair its brand image.

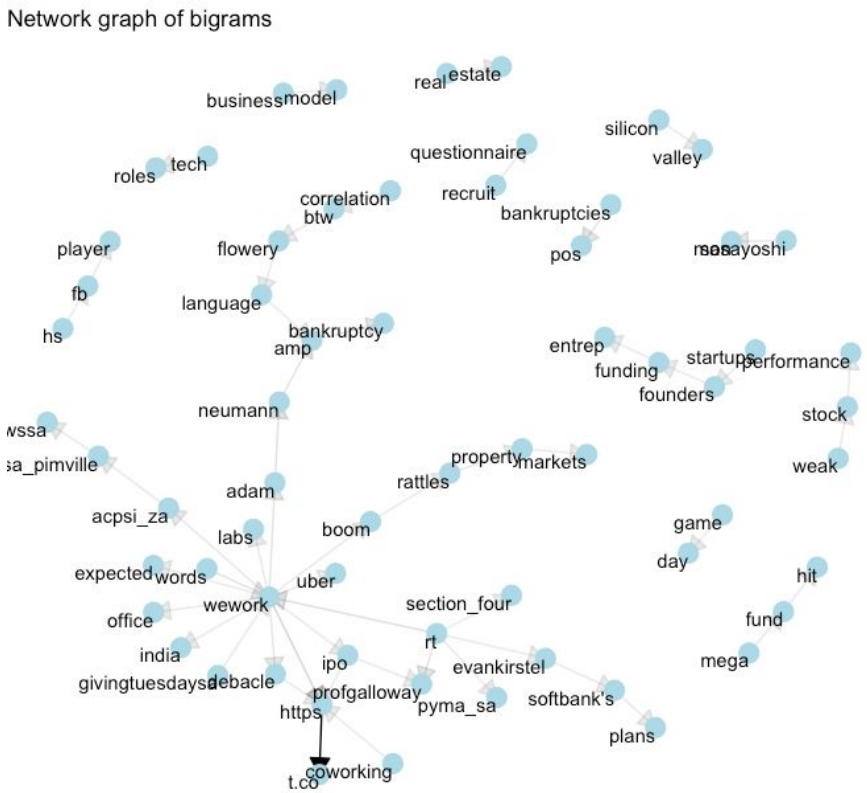


The first step was to gather and clean the most recent 1,200 tweets relating to WeWork as on 11 Oct 2019, including converting data to lower case, removing punctuation, numbers, stopwords and white spaces. The final histogram and word cloud are presented as follows:

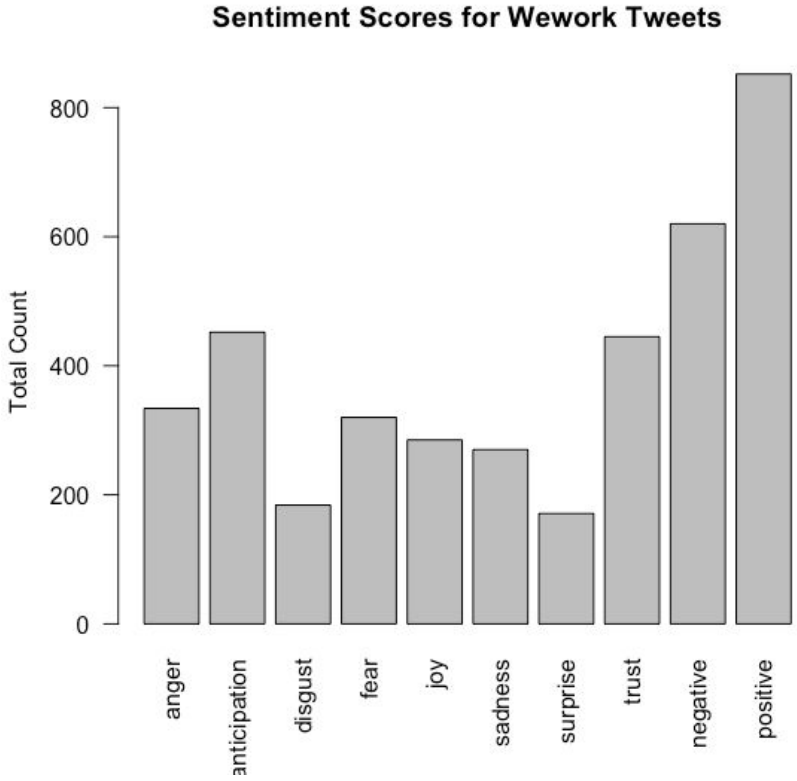


As can be seen in the Word Cloud and histogram, the words that usually appear in tweets about WeWord are IPO, Softbank, amp, bankruptcy. The second most used word in the tweets is Softbank, which invested over $11 billion in coworking company. Softbank is also one of the biggest Uber's investors, whose stock dropped over 30% since the company went public in past May. All the words which are occurring very frequently in recent tweets are explained, mostly because of the issues discussed, such as the company going public, asking for more investments from SoftBank, and also heading towards bankruptcy. According to the histogram, Uber was also frequently mentioned in the tweets about WeWork. In fact, the public has been buzzing about tech companies, such as WeWork and Uber, being extremely overvalued. People who will look at the picture could easily guess that there was something related to WeWork going public and financial issues related to that fact. Therefore, it proves that people are indeed concerned with the fact that WeWork was going public and this topic received a variety of emotional comments.

Additionally, the relationship between bigrams were examined, the pairs of two words. The graph below shows the most common bigrams in the set of tweets. The highest frequency among bigrams was under 30, and thus, it does not make sense to base our sentimental analysis on bigrams, but it provides as an additional insights of the content of the tweets. For example, one of the frequent words used in tweets is "weak" and based on the network graph, it can be identified that it most likely refers to the poor performance of WeWork's valuation.

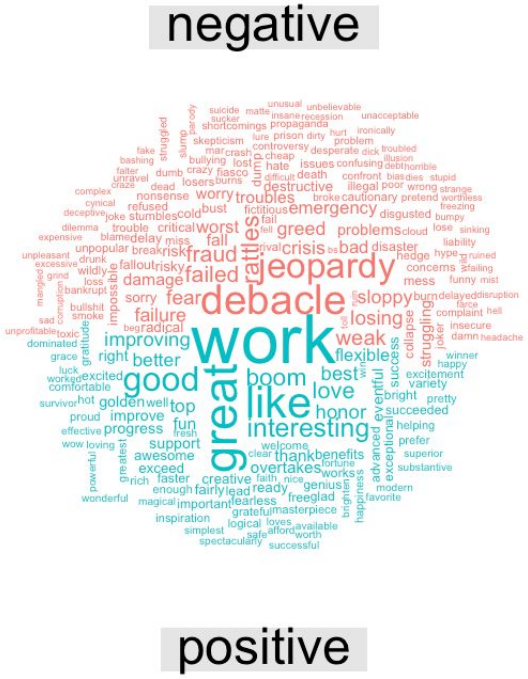


Further, to identify the reactions of the public, sentiment analysis of the tweets was performed, and the frequencies of the sentimental scores are plotted below:



From the above, it appears that the sentiments tend to incline towards the positive side for WeWork despite the recent news of its liquidity issues. For instance, the sum of the positive score is 852, which is nearly a third more than the negative score of 620. This also corroborates with the fact that the average number of tweets with positive score is 0.73, which is higher than that of 0.50 for tweets with negative scores, despite the range of both positive and negative scores being 0 to 4 with a median of 0. However, on further examination, it is observed that 587 of the tweets (49%) contained positive scores as compared to 431 tweets (36%) that had negative scores. Hence, this shows that the sentiments on Twitter towards WeWork may not be as polarized as demonstrated by the sentiment scores. Examples of the tweets with the highest positive and negative scores are also shown below for illustration:

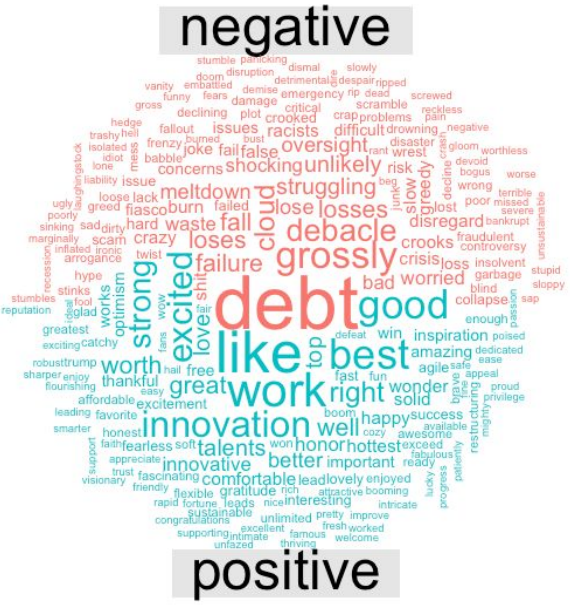
	Tweets
Positive (score of 4)	
Negative (score of 4)	

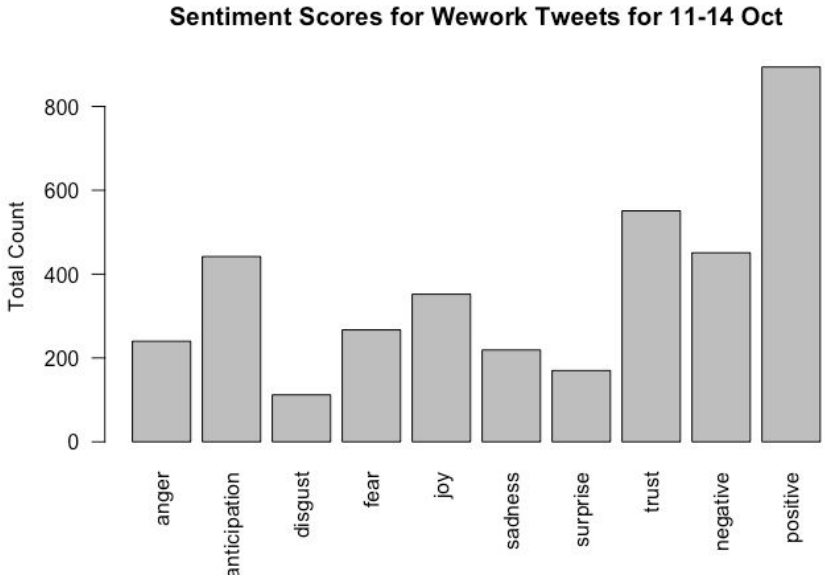


To further our sentimental analysis, on further examination of the frequency of the words that is labeled negative or positive. The larger, darker words in the centre appear more frequently than the smaller words towards the edge of the cloud (on the left). It demonstrates that, despite the recent news, the positive words are more frequently used than the negative ones. Among the more used positive words are "work", "great", "like", "good", which most likely are linked related to the work the company does or its culture. In terms of negative words, it is evident that the majority of tweets describe the public's attitude surrounding the company's recent events. The most frequently used negative words are "debacle", "jeopardy", "failed", "fraud". After its recent failed IPO, WeWork announced that it is expecting to lay off up to 25% of their employees in the beginning of October.

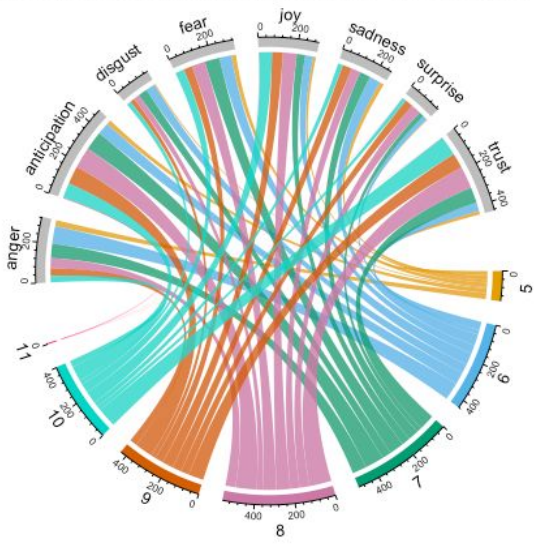
Such news may have contributed to the outrage of the public. As the word cloud illustrates, other frequently used words include “fear”, “losing”, “struggling”.

Our original analysis was based on tweets during the period of the 5-10th of October. During the weekend, there were several developments of their current position: Softbank, mentioned earlier, owns a third of the ownership of the company, is prepared to offer several billion dollars to buy equity and debt,to acquire the majority voting role. At the same time, WeWork has announced that it opened 622 new coworking spaces across 123 cities on October 10. Hence, we generated another set of 1,200 tweets dated from Friday, October 11 to Monday, October 14th were extracted, to see if there were changes in sentiments due to the recent breaking news. The wordcloud on the right shows the frequency of positive and negative words during that period. As illustrated, with the news announcement of Softbank potentially acquiring WeWork’s debt and equity, it was unsurprising that the most cited word among the tweets about WeWork last weekend was ‘debt’ which displaced the earlier negative words such as “debacle”. While “debt” itself is a negative word, in the context of Softbank’s potential financial injection into WeWork, our view is that the sentiments may not be as negative as it seems. When we examined the positive words, they are mostly related to the work at the company as similar to the word cloud above, with the most frequently cited words being “work”, “innovation”, ‘strong’. This could also be linked to the news of WeWork’s opening of new offices. Our inference was proven right after we plotted the sentiment scores for the period Oct 11-14, where there seems to be an overall drop in negative sentiments:



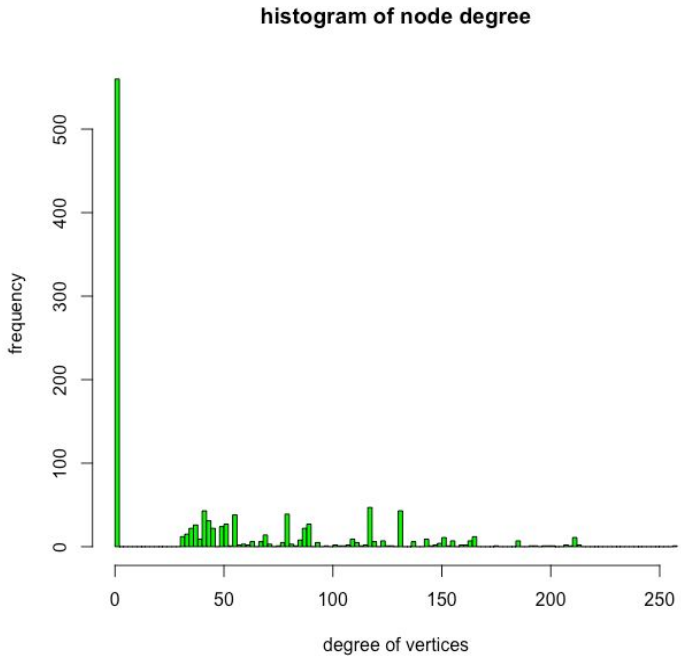


Relationship Between Emotion and Tweets' Creation Day in Oct 2019



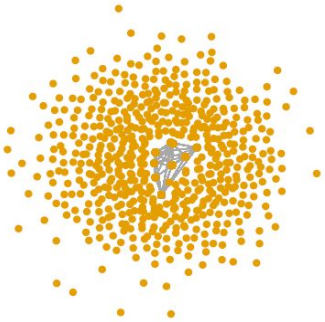
The orignal tweets collected ranged from the 5th of October, to the dusk of 10th October (carrying on to 11th for a few time zones). Majority of the tweets were created on October 8th, of which mostly displayed emotions such as trust, anticipation, and joy. This was mainly because that was the day WeWork opened its first Palo Alto location, amidst the controversy they were in, which gave investors and other affiliated people a ray of hope. This is also apparent by most of the tweets in the date range portraying a sentiment of anticipation, as it is expected that people are looking forward to getting some clarity about the status of operations at WeWork.

Social Network Analysis



Additionally, a social network analysis on the tweets was conducted to determine and understand the social interactions (or lack thereof) between them. First, it was examined how connected the tweets are by mapping each tweet as a node and its associated tweet activity (e.g. re-tweeting) as a vertice. The connnected-ness of a tweet would be determined by the number of degrees (i.e. number of vertices connected to it) which the frequencies and the network graph are plotted below:

It is within our expectations that most tweets (560, which amounts to around 47% of the total tweets) are not connected to other other tweets (i.e. zero degree).

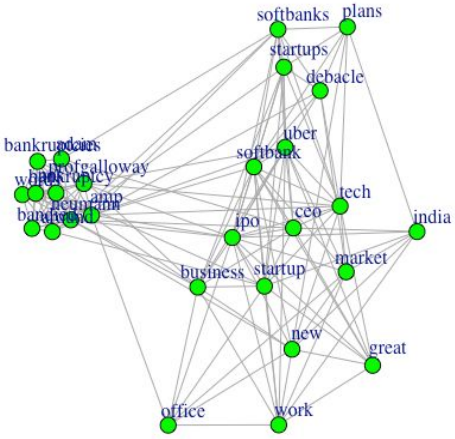


The network of tweets also shows the disconnection of the tweets with one another. As seen from the network, there are many tweets about WeWork that have no connections and only several in the middle that are actually interconnected.

It was later observed the tweets that are interconnected. The most connected tweet has 256 degrees which pertains to the following tweet:

Interestingly, that particular tweet did not receive any sentiment scores, likely due to its content being pictorial in nature. Nonetheless, such pictorial tweets could encompass or convey sentiments but are not captured by the above sentiment scoring matrix, which represents a limitation in the analysis. Considering the above tweet seems to connote sarcasm (i.e. a negative reaction) at WeWork's funding prospects and has such high connected-ness, this could potentially swing the overall sentiment analysis towards the negative side as opposed to the ostensible positive trend in the sentiment scores.

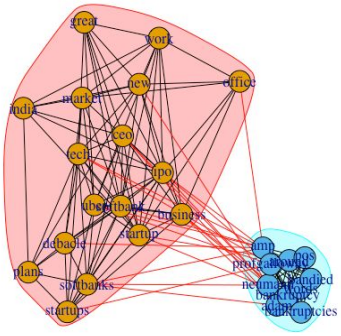
Furthermore, the degree of the words was visualised, including the terms that have a frequency of more than 30. From the graph on the right, it can be seen that the words that are clustered closely together are related to the potential bankruptcy and WeWork's CEO.

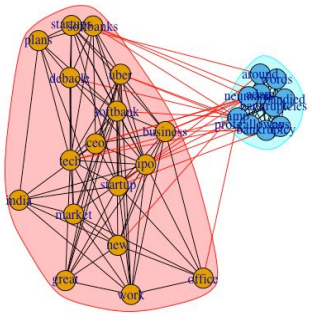


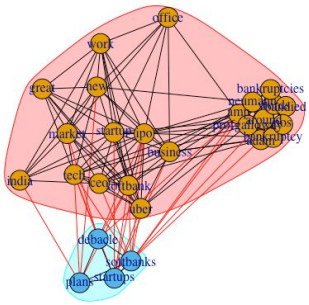
Several methods were used to identify the clusters, including techniques based on edge betweenness (which identifies the shortest paths), label propagation (where the label of each node represents the highest frequency labels in its surroundings) and greedy algorithm (that maximizes the similarity within the clusters). In these plots, different dense areas are identified as separate clusters. For each of the algorithms, similar clusters were identified. One cluster is closely related to the bankruptcy itself and the second cluster contains the topics that either are the implications or consequences of recent events, such as SoftBank or Uber, or the general description of the business. It is worth noting that during this current turbulent time for WeWork, the public is actively talking about the company's current state and the consequences of the failed IPO, as indicated by both clusters identified by the three different methods above.

Besides the above, according to the wordcloud of the most frequently used words in dataset as presented on the first page of the report, one of the most frequently used words was "profgallow". Interestingly, as presented by the clusters below, "profgallow" is strongly interconnected with the cluster that is related to the bankruptcy. Upon further investigation, it was found that "profgallow" refers to the NYU clinical

Professor Scott Galloway of marketing, who has published several articles predicting that more Silicon Valley companies are going to follow in WeWork's footsteps and fail in the future. His articles are highly talked about, and is a sign that the experts/influencers have the ability to influence the public's opinion on the topic.







In addition, from the above clusters and the network graph on the left, it seems that the word IPO is one of the few words that actually connects two clusters of words together. This is also vindicated by it having the highest betweenness and closeness as shown in the tables below. Betweenness centrality is a measure of centrality based on the shortest path, thus, the node with the high level of betweenness has sizeable influence on the flow of the information. The closeness centrality, on the other hand, measures the distance between one node and all others in the network. In addition, from closer examination, words like bankruptcy, bandied, bankruptcies etc. are related to the word IPO, which indicates that people think WeWork going public actually might end in bankruptcy and/or have negative repercussions.

closeness.g.	text
9.106556e-06	ipo
9.080178e-06	work
9.079766e-06	softbank
9.073011e-06	business
9.070953e-06	uber
9.062486e-06	amp

betweenness.g.	text
541909.3	ipo
300884.2	softbank
273603.4	work
237129.7	amp
233150.5	business
207697.4	new

Conclusion

The trigger to perform the sentimental analysis about WeWork was our interest in the public's reaction to the breaking news surrounding the company. One of the biggest events that generated high quantity of tweets was the failure of WeWork to go public and its consequences. People expressed variety of emotions following the news of mismanagement and financial irresponsibility of the executives. To get a full understanding of how people reacted to the news, we approached WeWork's case with quantitative and qualitative approach.

Through sentimental analysis and online search, we found numerous interesting insights. For example, our a-priori expectation was that the majority of the public would lose trust in WeWork following its financial fiasco, and therefore, the overall sentiment would likely be negative. However, when we compared the positive and negative words in the tweets across two periods (i.e. Oct 5-11 and Oct 11-14), the attitude of the public was ostensibly changing for the better. Through examining the most common words that appeared in the tweets, we managed to gather new insights from the news related to those words. For instance, we believe the improvement in sentiment is most probably due to the news that Softbank would potentially be injecting further capital into WeWork.

The next step in our analysis was conducting a social network analysis. During this process, the centrality measures, such as closeness, betweenness and degree centrality were examined. Through our analysis, we found out a large shortcoming of the sentiment analysis, which is the fact that it cannot read tweets with pictorial nature. This is a very pertinent drawback, because tweets that tend to be reposted the most are usually pictorial in nature and can have valuable information within them. As in the example we provided above, the tweet that was reposted over 200 times had a neutral score given by the sentiment analysis, but the content of the picture was certainly negative. This finding helped us to realize that it is always necessary to delve deeper into the tweets to get a clearer picture of the true sentiments that are expressed by the public.

In addition, by creating network graphs, we identified clusters using three different methods, each yielded very similar results. Each of the two clusters referred to the recent IPO and potential bankruptcy, which implied that the public was concerned over WeWork's financial sustainability. By doing clustering, we found out that "profgallow" and "IPO" are some of the frequently linked words. From our research, we found out that those words are related to people's predictions that were based on the analysis conducted by Professor Scott Galloway, who posited that some companies in the Silicon Valley are going to face difficulties similar to WeWork's situation. In general, it seems that this prediction had spread across people really fast and adversely affected the overall reaction of the public, as demonstrated by the illustration of the emotions and tweets creation day, where majority of the tweets in the early period of our dataset (i.e. Oct 5/6) are more negative in nature. This was attenuated when news of WeWork's opening of new offices and potential bailout by SoftBank emerged later during the week.

All in all, our sentiment analysis have found that WeWork is a hotly discussed company in Twitter given the numerous amount of tweets relating to it in the past week. The results of our analysis were contrary to our intuition that WeWork has lost its public credibility following the recent unfavourable and controversial news surrounding it. Nonetheless, we noted that there may be limitations to the sentiment analysis tool that we employed which could possibly fail to capture an accurate or complete picture of the public's reaction to WeWork. Therefore, further analyses (such as web-scraping or text mining) would have to be further conducted for us to draw any reliable conclusions.