



IS434 Social Analytics & Application

Final Report

Grub Singapore

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Group 10

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1. Our Client

Grub Singapore is a fun burger bistro located at the heart of Bishan-Ang Mo Kio Park. The bistro is surrounded by lush greenery, water play areas and children's playgrounds. As such, their main target audience are the residents with young children staying in the neighbourhood. Grub has a high social media presence, with close to 10,000 followers on Facebook and approximately 2000 followers on Instagram. In addition, Grub has been featured in popular food review websites like Burpple, Yelp and HungryGoWhere.

2. Business Problems

The owners of Grub have noticed that there are not many new faces visiting Grub. They host special events, like "Sticker Buffet with Faber-Castell" and other fun activities for children at least twice a month. These activities are targeted at the families with young children. However, the owners have noticed that the participants are always their regular customers.

In addition, Grub would like to find out what they can improve on by looking at what the public likes about their competitors. Together with the owners of Grub, we have came up with 3 competitors which we will be looking into. Canopy Garden and The workbench Bistro were selected due to their close proximity to Grub, while Fat Boys was selected due to the similarity in the food they serve.

3. Goals

Firstly, our project aims to help Grub expand their consumer base beyond their regulars, which are the families who live in the neighbourhood. One way to do so will be to approach social media influencers. Hence, we aim to profile the active users that have commented on Grub's posts. This will be done through the following steps:

1. Identifying the users who have commented on Grub's posts
2. For each unique user:
 - a. Get the number of comments made on Grub's posts
 - b. Get the number of followers
 - c. Get the number of posts made in the past month
 - d. Get the description of the account, provided by the user.

These variables are chosen because we think that they are important in choosing the most optimal influencer. The number of followers is important because more users will see the posts made by a user with more followers. The number of comments made on Grub's posts was factored in because it is a rough indicator of their interests in Grub. Lastly, the number of posts made in the last month was included because we wanted to give a higher weighting to users

who are active on social media. With these factors in mind, we will come up with a metric to rank the users. We will also be looking at the user profiles' descriptions to have a more targeted approach. For example, we will be looking out for users who are similar to Grub's target audience.

In addition, by conducting hashtag analysis, we aim to find out which are the hashtags that garner a high average weighted reaction from the public. Using the right hashtags may increase the public's awareness of Grub, which may translate to new faces for the business.

Furthermore, we aim to analyze what the public is saying about Grub's competitors'. We will then compare them to what is said about Grub. This way, we will be able to suggest aspects that Grub can improve on.

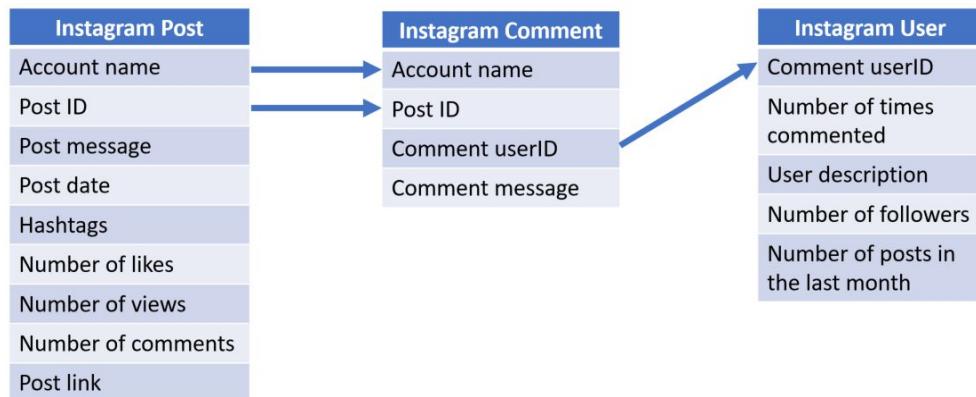
4. Our Data

Currently, our client does not have any of the data we require. As such, all the data in this project are obtained through scraping, crawling, or through API calls. To analyse Grub and its competitors' current social media presence, we required their Facebook and Instagram data. In addition, we scraped Yelp, Burpple, HungryGoWhere and TripAdvisor since they are the major food review websites in Singapore.

4.1 Instagram

Initially, we tried to utilise the Instagram API to collect Grub's data. However, the Instagram API was too restrictive. We noticed that Grub and its competitors' accounts are public accounts, which meant that we did not need to login to Instagram to access them on a browser. Hence, we manually scraped Instagram for the data we required.

To conduct our analyses, we needed the data on posts, comments on posts, and the users that commented on the posts.



Scrolling on Instagram

The screenshot below shows Grub's instagram page on chrome:



Accessing Instagram pages on the browser will only show the 12 latest posts made by the account. To view more posts, we will first need to click the “Load More” button. However, this will only reveal the next 12 posts. To get all the posts after doing this, we will need to do an infinite scroll to go all the way to the bottom of the page.



Hence, in our python script, we used the Selenium WebDriver to scroll to the maximum depth.

```

#click on load more button
load_more = driver.find_element_by_xpath("//a[contains(@class, '_lcr2e _epyes')]") 
load_more.click()
time.sleep(2)

#infinite scroll to get all posts
# Get scroll height
last_height = driver.execute_script("return document.body.scrollHeight")
while (True):
    # Scroll down to bottom
    time.sleep(3)
    driver.execute_script("window.scrollTo(0, document.body.scrollHeight);")
    # Wait to load page
    time.sleep(3)
    # Calculate new scroll height and compare with last scroll height
    new_height = driver.execute_script("return document.body.scrollHeight")
    if new_height == last_height:
        print("maximum depth")
        break
    else:
        last_height = new_height

#load into beautiful soup
page_html = driver.page_source
soup = BeautifulSoup(page_html, "lxml")

```

Getting post and comment details

To get the required data for every post, we would need to click on each post.:



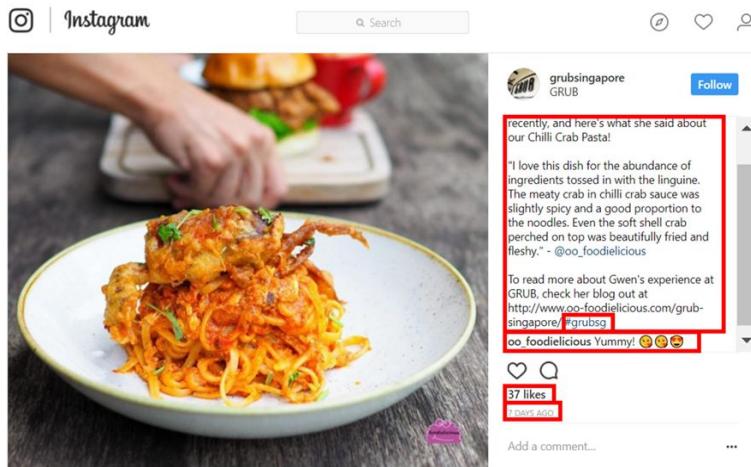
Upon inspection of the page source, we noticed that we could get the link for each post. Hence, we retrieved all the individual posts' links, instead of clicking on every post.

```

▼<div class=" _mck9w _gvoze _f2mse">
  ▼<a href="/p/BaI45AZDY3s/?taken-by=grubsingapore"> == $0
    ▼<div class=" _e3i12">
      ▼<div class=" _4rbun">
        <img alt="We've had the pleasure of having fellow foodie Gwendolyn at GRUB recently, and here's what she said about our Chilli Crab Pasta!">
        "I love this dish for the abundance of ingredients tossed in with the linguine. The meaty crab in chilli crab sauce was slightly spicy and a good proportion to the noodles. Even the soft shell crab perched on top was beautifully fried and fleshy." - @oo_foodielicious
        To read more about Gwen's experience at GRUB, check her blog out at http://www.oo-foodielicious.com/grub-singapore/ #grubsg class=" _2di5p" src="https://instagram.fsin1-1.fna.fbcdn.net/t51.2885-15/s640x640/sh0.08/e35/c76.0.927.927/22500039_1942939545967392_4963975604165672960_n.jpg" style>
      </div>
      <div class=" _si7dy"></div>
    </div>
  </a>
</div>

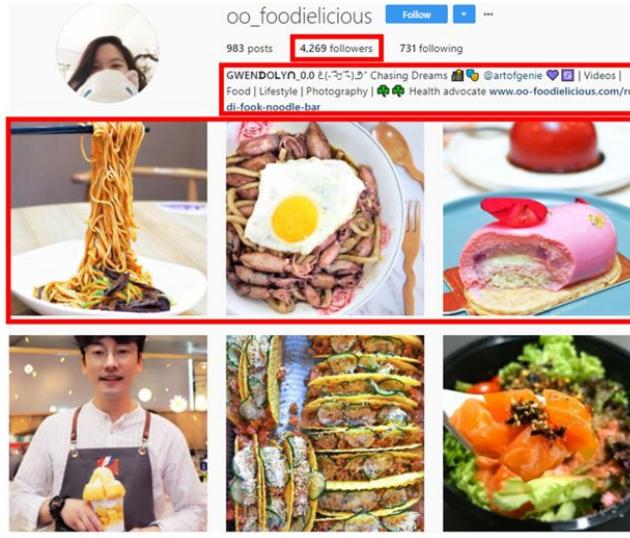
```

We then used the webdriver to navigate to every post, to scrape the required data.



Getting user details

Now that we have the userID of all the users who commented on Grub's posts, we can navigate to their pages. To help us profile Grub's active followers on Instagram, we will be looking at the number of times the user has commented on Grub's posts in the last 100 posts, the account description, the number of followers, and the number of posts made in the last month. We set the limit to the last 100 posts, to match the limitations of Facebook's API, and to ensure that the users have recently interacted with Grub's posts.



Summary of data

All the data are stored in excel files. Screenshots of the Instagram posts and comments are shown in Figure 1 and Figure 2 respectively. This is done for both Grub and its 3 competitors.

| company | post_id | post_message | post_date | hashtags | num_likes | num_views | num_comments | post_link |
|---------------|---------|-------------------------------|--------------------------|----------------------------|-----------|-----------|--------------|--|
| grubsingapore | 1 | The year-end holidays are fi | 2017-11-20T01:01:12.000Z | decemberholidays ,school | 10 | 0 | 0 | https://www.instagram.com/p/BbsgbUj2jpNm/?taken-by=grubsingapore |
| grubsingapore | 2 | This Saturday (18th Nov), ca | 2017-11-17T10:24:28.000Z | livebands ,livemusic ,live | 23 | 0 | 0 | https://www.instagram.com/p/Bbl8gMLD1sw/?taken-by=grubsingapore |
| grubsingapore | 3 | GRUB's signature Churros ar | 2017-11-15T01:04:30.000Z | grubsg | 48 | 2 | 2 | https://www.instagram.com/p/Bbfy1HADHqG/?taken-by=grubsingapore |
| grubsingapore | 4 | Calling all cheese fanatics! | 2017-11-13T03:35:38.000Z | grubsg | 22 | 0 | 0 | https://www.instagram.com/p/Bba6SIUjqQ/?taken-by=grubsingapore |
| grubsingapore | 5 | GRUB's iconic Sand Art acti | 2017-11-09T12:46:04.000Z | sgkids ,playmatters ,lear | 33 | 0 | 0 | https://www.instagram.com/p/BbRmWRAjkDy/?taken-by=grubsingapore |
| grubsingapore | 6 | Our Chicken Teriyaki Pizzas | 2017-11-07T10:00:51.000Z | grubsg | 20 | 1 | 1 | https://www.instagram.com/p/BbMj2zPj8C3/?taken-by=grubsingapore |
| grubsingapore | 7 | October's Sensory Playdate | 2017-11-06T03:38:00.000Z | messyfingers.sg ,grubsg | 10 | 1 | 1 | https://www.instagram.com/p/BbI5PevDGZQ/?taken-by=grubsingapore |
| grubsingapore | 8 | GRUB LIVE MUSIC SESSI | 2017-11-03T10:24:18.000Z | livebands ,livemusic ,live | 31 | 1 | 1 | https://www.instagram.com/p/BbB5WPWJMRS/?taken-by=grubsingapore |
| grubsingapore | 9 | Q: What's better than Truffi | 2017-11-02T08:32:49.000Z | grubsg | 44 | 1 | 1 | https://www.instagram.com/p/Ba_HzRODXig/?taken-by=grubsingapore |
| grubsingapore | 10 | Last Saturday (28 Oct) was t | 2017-11-01T09:08:18.000Z | parksfestival2017 ,salads | 10 | 0 | 0 | https://www.instagram.com/p/Ba8nEU5DF1a/?taken-by=grubsingapore |
| grubsingapore | 11 | GRUB will be closed for a pri | 2017-10-31T06:58:38.000Z | | 13 | 0 | 0 | https://www.instagram.com/p/Ba5zbyIDV/?taken-by=grubsingapore |
| grubsingapore | 12 | Good ideas begin with great | 2017-10-30T01:01:08.000Z | mondaymood ,mondayc | 19 | 0 | 0 | https://www.instagram.com/p/Ba2luz_DpqN/?taken-by=grubsingapore |
| grubsingapore | 13 | Almost halfway through Chi | 2017-10-27T10:30:59.000Z | grubsg | 57 | 1 | 1 | https://www.instagram.com/p/Bav4JlRjgTX/?taken-by=grubsingapore |
| grubsingapore | 14 | Bat that midweek slump w | 2017-10-25T04:24:27.000Z | midweek ,eatclean ,grub | 41 | 0 | 0 | https://www.instagram.com/p/BaqfBJTjCd0/?taken-by=grubsingapore |
| grubsingapore | 15 | Last Saturday was the sticke | 2017-10-23T02:50:23.000Z | fabercastellsg ,stickeymai | 34 | 0 | 0 | https://www.instagram.com/p/BawqwdjctI/?taken-by=grubsingapore |
| grubsingapore | 16 | Sensory play has been prove | 2017-10-21T02:04:24.000Z | sgkids ,playmatters ,sens | 51 | 4 | 4 | https://www.instagram.com/p/Bafh7zqjUn7/?taken-by=grubsingapore |
| grubsingapore | 17 | Meet our new and improved | 2017-10-20T09:38:55.000Z | grubsg | 38 | 0 | 0 | https://www.instagram.com/p/BadxCfjijUV/?taken-by=grubsingapore |
| grubsingapore | 18 | GRUB Live Music Sessions w | 2017-10-19T13:15:57.000Z | livebands ,livemusic ,live | 26 | 0 | 0 | https://www.instagram.com/p/BabIxDwms/?taken-by=grubsingapore |
| grubsingapore | 19 | GRUB will be open all day fo | 2017-10-17T13:12:37.000Z | coffee ,cafehoppingsg ,bi | 52 | 1 | 1 | https://www.instagram.com/p/BaWbGk69qa/?taken-by=grubsingapore |
| grubsingapore | 20 | We've had the pleasure of h | 2017-10-12T07:03:32.000Z | oo_foodielicious ,grubsg | 39 | 1 | 1 | https://www.instagram.com/p/Bal45AZDY3s/?taken-by=grubsingapore |

Figure 1: Posts extracted from Grub's Instagram posts

| company | post_id | comment_message | comment_userid |
|---------------|---------|---|------------------|
| grubsingapore | 3 | I love it 😊😊 | oseki |
| grubsingapore | 3 | hi! Check ur dm :) | conjering |
| grubsingapore | 6 | ONE OF THE BEST I HAVE SEEN! 😊😊mr.ctky | |
| grubsingapore | 7 | Thanks for the mention guys! We alv messyfingers.sg | |
| grubsingapore | 8 | ☺️☺️☺️ | thevilleband |
| grubsingapore | 9 | I LOVE THIS | dominicseesyou |
| grubsingapore | 13 | @daphne8623 @angelsmilez @tazil boon8623 | |
| grubsingapore | 16 | Must we register ? | chipmunksmummy |
| grubsingapore | 16 | Oki! | chipmunksmummy |
| grubsingapore | 16 | @roseaustero let's try this in school | jingxunnn |
| grubsingapore | 16 | @jingxunnn lets!!! Next week. | roseaustero |
| grubsingapore | 19 | Very cool feed! | thatboheme |
| grubsingapore | 20 | Yummy! 😊😊😊 | oo_foodielicious |
| grubsingapore | 26 | ☺️ | emotionsbook |
| grubsingapore | 27 | love it! ❤️ | yayareayum |
| grubsingapore | 29 | great work! loving it! | cassidykylanieka |

Figure 2: Comments extracted from Grub's Instagram posts

The table below shows the total number of posts and comments that we have extracted from Grub and its 3 identified competitors.

| | Grub | Fat Boys | Canopy Garden | The Workbench Bistro |
|--------------------|------|----------|---------------|----------------------|
| Number of posts | 100 | 100 | 32 | 91 |
| Number of comments | 59 | 149 | 58 | 120 |

We will only be doing user profiling for Grub's users. Figure 3 below shows the data we collected for Grub's Instagram users.

| userid | num_commented | description | num_followers | num_posts | total_likes |
|------------------|---------------|---|---------------|-----------|-------------|
| conjering | 1 | ♡ jerlyn yeo ♡ how many shrimps do | 1306 | 7 | 1531 |
| mr.ctky | 1 | Celester Tan 别问我是谁 🎭 ESGBKR. | 5592 | 5 | 2254 |
| messyfingers.sg | 2 | Messy Fingers SG SG based. Makers of | 1021 | 6 | 176 |
| thevilleband | 1 | The Ville Knoxville's finest original ind | 584 | 13 | 952 |
| dominicseesyou | 1 | Dommy Christian Chin 曾浩源 ✎ I li | 2494 | 14 | 2178 |
| chipmunksmummy | 2 | Karen Ang Mummy to 3 chipmunks • | 965 | 11 | 2405 |
| jingxunnn | 1 | Jingxun ♡ TO LIVE, LAUGH & LOVE ♡ | 804 | 2 | 125 |
| thatboheme | 1 | Buckle Up Buttercup. 🍃 Founder of @ | 10879 | 19 | 7416 |
| oo_foodielicious | 1 | GWENDOLYN_0.0 ლ(ಠ益ಠ)ლ" Chasii | 4688 | 45 | 13423 |
| emotionsbook | 1 | Library of Feelings 📚 NEW picture bo | 1747 | 3 | 443 |
| yayareayum | 1 | BAY AREA FOODIES MOVEMENT Shar | 649 | 0 | 0 |
| cassidykylanieka | 1 | CassidyKylanieka | 148 | 25 | 359 |
| liz_474 | 1 | Liz Stewart Mom 🌸 RN 🌸 Lipsense I | 3963 | 10 | 1323 |
| rasautara | 1 | Rasa Utara Berjaya Times Square, KL | 10356 | 20 | 7438 |
| thebarrybrothers | 1 | The Barry Brothers Brothers who play | 14715 | 0 | 0 |

Figure 3: Users extracted from Grub's Instagram comments

4.2 Facebook

We made use of Facebook Graph API to retrieve the latest 100 posts. To utilise the Facebook Graph API, we generated an access token for GRUB's facebook page. For each of the 100 posts, we extracted the following information:

1. The unique id of the post
2. Post message content
3. Total number of emotional reactions; which are further broken down into the number of loves, likes, wow, haha and negative reactions
4. Total number of comments
5. Number of shares

The data is stored in a single excel file as shown below (Figure 4).

| | post id | post message | num of reactions | num of loves | num of likes | num of wow | num of other reactions | number of comments | number of shares |
|----|--------------------------|--|------------------|--------------|--------------|------------|------------------------|--------------------|------------------|
| 0 | 89821232494_141277121883 | A hearty bowl of linguine tossed with a gene | 19 | 0 | 19 | 0 | 0 | 0 | 0 |
| 1 | 89821232494_141098214901 | ngular popular hits, as well as singing a mix of ori | 4 | 0 | 4 | 0 | 0 | 0 | 0 |
| 2 | 89821232494_141098955234 | ocolate and Yuzu White Chocolate dips, this | 17 | 0 | 17 | 0 | 0 | 0 | 0 |
| 3 | 89821232494_141103205234 | heese centre in a grilled beef patty (200g) & | 10 | 0 | 10 | 0 | 0 | 0 | 0 |
| 4 | 89821232494_141271083884 | own and loving our cheesy burgers, we're so | 25 | 0 | 25 | 0 | 0 | 5 | 0 |
| 5 | 89821232494_140310411313 | me down from 9am - 12pm and discover th | 3 | 0 | 3 | 0 | 0 | 0 | 0 |
| 6 | 89821232494_139345599743 | ks, teriyaki glaze, melted cheese and bonito | 8 | 0 | 8 | 0 | 0 | 0 | 0 |
| 7 | 89821232494_140392147638 | flowers. Catch next month's installation of S | 19 | 0 | 19 | 0 | 0 | 0 | 0 |
| 8 | 89821232494_139447505399 | o bringing us a mix of acoustic covers and inc | 4 | 0 | 4 | 0 | 0 | 0 | 0 |
| 9 | 89821232494_139338858410 | favourites - Truffle Aioli Fries and Chicken F | 4 | 0 | 4 | 0 | 0 | 0 | 0 |
| 10 | 89821232494_140322006645 | rticipants got to make their own salads strai | 25 | 0 | 25 | 0 | 0 | 0 | 0 |
| 11 | 89821232494_140390727638 | n. To find out more about how you can book | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 12 | 89821232494_139443035400 | e fuel at GRUB and start off your week with a | 19 | 0 | 19 | 0 | 0 | 0 | 0 |
| 13 | 89821232494_138736748470 | rrown chicken thigh with our special housema | 25 | 0 | 25 | 0 | 0 | 0 | 0 |
| 14 | 89821232494_138734069804 | d greens, onions, cherry tomatoes) and a light | 16 | 0 | 16 | 0 | 0 | 0 | 0 |
| 15 | 89821232494_139675635373 | time bonding over colouring and making thei | 4 | 0 | 4 | 0 | 0 | 0 | 0 |
| 16 | 89821232494_137959266548 | sory water beads and a storytelling session b | 16 | 0 | 16 | 0 | 0 | 0 | 0 |

Figure 4: Information of the posts

For each comment, we extracted the username and comment message.(Figure 5).

| | owner_id | review_body |
|---|---------------------|---|
| 0 | Rachel Tan-Hwee | David Hwee |
| 1 | Krista Gomez | Kim Gabriel Encarnacion |
| 2 | Ryan Tan Choon Hong | Hy Chen this burger looks gd at Bishan amk Park  |
| 3 | Eileen Teo | Adeliine Teo |
| 4 | JesLyn Tan | Jason NgLets go one of these days... |
| 5 | Amanda Ang-Phan | YUMZ! |
| 6 | Amilyn Khoo | Evelyn Chan |
| 7 | Lim Li Mei | Lim Jiadi |
| 8 | Julene Aw | This is too cute!! |
| 9 | Freddie Yeo | This is so cool!! |

Figure 5: Commenter's username and comment content

We noticed that some users tend to comment multiple times. Hence, we have combined the total number of comments each of them made. Since there are only 22 unique users who commented on Grub's posts, we manually collected their number of friends. As some are private

users, we were unable to retrieve the number of friends they have. The results are shown below.

| | owner_id | num_times_commented | Number of friends |
|----|-----------------------|---------------------|-------------------|
| 0 | Rachel Tan-Hwee | 1 | 460 |
| 1 | Krista Gomez | 1 | 861 |
| 2 | Ryan Tan Choon Hong | 1 | nil |
| 3 | Eileen Teo | 1 | 230 |
| 4 | JesLyn Tan | 1 | 221 |
| 5 | Amanda Ang-Phan | 1 | nil |
| 6 | Amilyn Khoo | 1 | 953 |
| 7 | Lim Li Mei | 1 | 1030 |
| 8 | Julene Aw | 1 | 208 |
| 9 | Freddie Yeo | 1 | nil |
| 10 | Gary Fong | 1 | nil |
| 11 | Wiz-kelyfa Young | 1 | 290 |
| 12 | Fatma Nurlaili | 2 | 658 |
| 13 | Jay Aw | 1 | nil |
| 14 | Alvin Loh | 1 | nil |
| 15 | Mong Jie | 1 | nil |
| 16 | Beatrice Wong | 1 | 850 |
| 17 | Kuan Yii | 1 | nil |
| 18 | 彩萍 | 1 | 26 |
| 19 | Theodosia Tan | 1 | nil |
| 20 | Sangamithra Siddharth | 1 | nil |
| 21 | Parasu Chris Morgan | 6 | nil |

Figure 6: Facebook user data

Here is the summary of data collected from Facebook:

| | posts | comments | Public users |
|-----------------------|-------|----------|--------------|
| Number of data points | 100 | 28 | 11 |

4.3 Yelp

Based on the page source, we retrieved all the reviews that are about Grub and its 3 competitors. For each review, we extracted the company name, username, review message, review date, star rating and the voting(Useful, Funny, Cool). The other competitors data are also stored with the same format. We select 6 most representative stores for fat boy and combined them with the same company name. The data is stored in single excel file as shown below (Figure 7).

| Company | ReviewMessage | ReviewDate | ReviewStar | UserName | Useful | Funny | Cool |
|---------|---|------------|------------|--------------|--------|-------|------|
| Grub | Came for brunch after family we | 14/10/2016 | 4 | JTT. | 0 | 0 | 0 |
| Grub | For a place with great locale, an | 9/9/2017 | 1 | Paul N. | 0 | 0 | 0 |
| Grub | Dinner here with friend. Came a | 1/4/2016 | 4 | Serene T. | 0 | 0 | 0 |
| Grub | It is probably a 3.5 stars place. N | 19/10/2013 | 4 | Carolyn L. | 2 | 0 | 1 |
| Grub | Came here at around 5.30pm or 28/2/2014 | | 4 | Steffenie S. | 0 | 0 | 0 |
| Grub | First impression of their mushro | 26/7/2013 | 3 | Ancy N. | 1 | 0 | 0 |
| Grub | I'm adding this to my list of unin | 15/3/2014 | 2 | Sonya C. | 1 | 0 | 1 |
| Grub | Similar to Two Chefs nearby, Gr | 17/12/2014 | 3 | Maria P. | 2 | 1 | 1 |
| Grub | Pretty decent food marred by ba | 12/9/2014 | 2 | L W. | 2 | 0 | 0 |
| Grub | I must confessed that I was grub | 22/8/2013 | 3 | Li T. | 0 | 0 | 0 |
| Grub | Very new on the Singapore scen | 13/6/2013 | 3 | Claire H. | 2 | 1 | 2 |

Figure 7: Reviews from Yelp

Here is a summary of data collected from Yelp:

| | Grub | Fat Boys | Canopy Garden | The Workbench Bistro |
|-------------------|------|----------|---------------|----------------------|
| Number of reviews | 19 | 59 | 10 | 5 |

4.4 HungryGoWhere

For each review, we extracted the review title, message, date, star rating, username, and aspect ratings (food, value, service, ambience). Below is a snapshot of data that we gathered from hungrygowhere:

| Company | ReviewTitle | ReviewMessage | ReviewDate | ReviewStar | NoOfRevie | UserName | Food | Value | Service | Ambience |
|---------|-------------------------------------|--------------------------------------|------------|------------|-----------|-------------|------|-------|---------|----------|
| 0 Grub | Don't order the burgers! | See the full review with pictures | 15-Oct-14 | 3 | 147 | pickledpea | 3 | 3 | 2 | 4 |
| 1 Grub | Grub is now open for lunch on week | For full review and photos, click H | 24-May-14 | 4 | 221 | SG Food on | 4 | 4 | 4 | 5 |
| 2 Grub | Very bad service | To be fair, the food do looks good | 15-Oct-13 | 1 | 43 | Lynne Chu | 0 | 0 | 1 | 0 |
| 3 Grub | ok food, bad service | Arrived at 2pm for brunch. | 24-Nov-13 | 1 | 4 | April Tan | 2 | 1 | 1 | 3 |
| 4 Grub | Good People. | We were itching for Churros and i | 30-Jun-13 | 4 | 9 | GeekyFood | 4 | 4 | 5 | 3 |
| 5 Grub | min. spending shock for group reser | Called and made a reservation on | 30-Jul-17 | 1 | 1 | See Guan F | 2 | 2 | 1 | 2 |
| 6 Grub | Love Grub! | The double cheeseburger was am | 17-Jul-17 | 5 | 2 | Dan Justin | 0 | 0 | 0 | 0 |
| 7 Grub | Purple Taste: GRUB @ Bishan Park | First time visiting during lunch ho | 23-Jan-16 | 3 | 342 | PURPLE | 3 | 3 | 3 | 4 |
| 8 Grub | Will visit only for ambience | Not a really value for money exp | 21-Jul-15 | 3 | 3 | Tee Ying Zi | 3 | 2 | 1 | 4 |
| 9 Grub | Nice Sunday Brunch | Visited Grub for a Sunday Brunch | 27-May-15 | 4 | 12 | Henry Gan | 4 | 3 | 4 | 5 |
| 10 Grub | Screwed up Experience! Mosquitoes! | Horrible experience I must say. Re | 15-May-15 | 1 | 1 | joycey | 0 | 0 | 1 | 1 |
| 11 Grub | Brunch in a park! | Quite a pleasant brunch we've ha | 4-Aug-14 | 3 | 6 | scorpio391 | 3 | 3 | 4 | 4 |
| 12 Grub | Dining @ Park | They started off from teaching co | 13-Jul-14 | 3 | 316 | 910910 | 0 | 0 | 0 | 0 |
| 13 Grub | Good, affordable western food | WeHungry went there on three di | 28-May-14 | 4 | 6 | wehungry | 4 | 4 | 4 | 5 |
| 14 Grub | Bistro Grub By the Park | Grub has just celebrated its first y | 8-May-14 | 4 | 2440 | Hoongy ! | 4 | 0 | 0 | 4 |
| 15 Grub | Good good, great ambience. | To see all photos taken, please | 23-Mar-14 | 3 | 121 | Peppermint | 3 | 3 | 3 | 4 |
| 16 Grub | Grub Singapore Review | Grub has a wonderful alfresco din | 2-Oct-13 | 4 | 8 | Sueyan Lim | 3 | 4 | 4 | 5 |
| 17 Grub | Worth a go for its mains and craft | This review came a little late. We | 18-Jul-13 | 3 | 4 | ossiez | 4 | 3 | 4 | 3 |

Figure 8: Reviews from Hungrygowhere

Here is a summary of data collected from HungryGoWhere:

| | Grub | Fat Boys | Canopy Garden | The Workbench Bistro |
|-------------------|------|----------|---------------|----------------------|
| Number of reviews | 88 | 0 | 54 | 12 |

4.5 Burpple

Similar to hungrygowhere and instagram, we also use selenium and Chrome Webdriver to solve the page data loading via scrolling and simulate page button clicking problems. The post owner Name, review message, review date, review source and review title are stored for subsequent analyses.

| owner_name | review_body | review_date | review_source | review_title |
|------------------|-------------------------------|------------------|-----------------------|---|
| Anthony Ali | ?? | May 21 at 5:16am | Instagram | ??Brunch in the park! |
| Alicia Yeo | One of the nicest pork filli | May 9 at 4:19pm | 16 Places To Chill Wi | Pork Yakiniku Burger @ GRUB |
| Shaowei Ho | This dish actually packs a li | Apr 1 at 5:25pm | Places Under \$20 | Chilli Crab Pasta (\$19++) |
| Shaowei Ho | After being sick of eating | Apr 1 at 5:41pm | Places Under \$20 | GRUB Double Cheeseburger \$19++ |
| I Want Good Food | Had the outdoor seats wh | Mar 8 at 9:00am | Brunch Food And Ca | Grub Cheeseburger (\$13) & Grub Brunc |
| Maureen Ow | Fish Burger - you have a | Mar 4 at 9:27am | Western | Champion Burgers Under \$20 |
| Cheryl Audy | No wonder this place is | Feb 1 at 12:48pm | Date Night | Grub Cheese Burger (\$13+), loved how |
| Jo. L?cq | •• | Dec 6, 2016 | Western | Grub Cheeseburger(\$13) & Mushroom |
| Chia Nicholas | That's a fried soft shell cra | Nov 22, 2016 | Instagram | Chili crab pasta! |
| Nicholas Chia | That's a fried soft shell cra | Jan 14 at 1:54pm | Instagram | Chili crab pasta! |
| Chia Nicholas | Thought I would order son | Nov 20, 2016 | Instagram | This is my second time at GRUB. |
| Vanessa Sng | Easily the best dish of the | Aug 21, 2016 | ??? | Truffle Bacon Baked Eggs |
| Cai Ying | Patty was soft and delicio | Jul 10, 2016 | Nice Sunday Brunch | Yummy Grub Burger |
| Jaslyn G. | The GRUB cheeseburger | Jul 17, 2016 | Best Brunch Locatio | GRUB-bed Lunch |
| Liang Wei Ong | I will recommend the | Jul 28, 2016 | Restaurant | Grilled Chicken Burger / Sakura Ebi Pas |
| John Lim | Was very very satisfied by | Jun 19, 2016 | Value Worth | Good Service, Food And Attitude From |
| Cheryl Erh | The aircon area was full | Jun 8, 2016 | Burgers! | Dining In The Park |

Figure 9: Reviews from Burpple

Here is a summary of data collected from Burpple:

| | Grub | Fat Boys | Canopy Garden | The Workbench Bistro |
|-------------------|------|----------|---------------|----------------------|
| Number of reviews | 275 | 199 | 86 | 39 |

4.6 TripAdvisor

To obtain the data, we used the same methods as the previous food review websites.

| company_name | review_body | website_name |
|--------------|--|--------------|
| Grub | It's been a while since I had a good cheeseburger with cheese oozi | TripAdvisor |
| Grub | Food is nice and the service was prompt. There's also a car park near | TripAdvisor |
| Grub | Nice ambience for gathering...in a park. The beef patty was too dry & | TripAdvisor |
| Grub | We have been to Grub many times now. Nice casual environment. Sal | TripAdvisor |
| Grub | Staff were very friendly. Asked for their help to give my girlfriend a bir | TripAdvisor |
| Grub | They were helpful in helping me arrange my reservation even though | TripAdvisor |
| Grub | The main aren't much to choose from and under Pastas mostly | TripAdvisor |
| Grub | Deluxe cheeseburger is thick and succulent. Chilli crab pasta would be | TripAdvisor |
| Grub | Nice environment, affordable and good food. Service was good as wel | TripAdvisor |
| Grub | i came here often to have our meal. usually once a month or once eve | TripAdvisor |
| Grub | I requested for an outdoor corner table in my reservation, and was | TripAdvisor |
| Grub | Food and service were great, atmosphere was completely relaxed and | TripAdvisor |
| Grub | Wonderful cafe setting for families. And they organise sensory play | TripAdvisor |
| Grub | Conveniently located with parking facilities nearby. Nice place to hab | TripAdvisor |
| Grub | Ordered har chong gai burger & fish burger. Nice food. Huge portion. | TripAdvisor |
| Grub | The mentaiko fries was yummy. In general, food portion is big and nic | TripAdvisor |
| Grub | first visit to grub at amk /bishan park. as we have a group of 10 perso | TripAdvisor |
| Grub | Good atmosphere good food good price nice love it service ok drinks | TripAdvisor |

Here is a summary of data collected from TripAdvisor:

| | Grub | Fat Boys | Canopy Garden | The Workbench Bistro |
|-------------------|------|----------|---------------|----------------------|
| Number of reviews | 310 | 231 | 329 | 40 |

5.Completed Analyses

5.1 The Most Influential Customer

Engaging the right influencers can increase the public's awareness of Grub. For this analysis, we will attempt to identify the influencers that Grub could approach.

5.1.1 Instagram Influencers

Based on the Instagram posts and comments, we counted the number of times each unique user commented on Grub's posts. Then, we navigated to each user's Instagram page, to get their description, number of followers, number of times posted in the past month, and the total number of likes for the considered posts. A snippet of the results is shown in Figure 10 below. In

the past 6 months, 65 public users have commented on Grub's posts.

| userid | num_commented | description | num_followers | num_posts | total_likes |
|------------------|---------------|---|---------------|-----------|-------------|
| conjering | 1 | ♡ jerlyn yeo ♡ how many shrimps do | 1306 | 7 | 1531 |
| mr.ctky | 1 | Celester Tan 别问我是谁 🎭 ESGBKR. | 5592 | 5 | 2254 |
| messyfingers.sg | 2 | Messy Fingers sg SG based. Makers of | 1021 | 6 | 176 |
| thevilleband | 1 | The Ville Knoxville's finest original ind | 584 | 13 | 952 |
| dominicseesyou | 1 | Dommy Christian Chin 曾浩源 ✎ I li | 2494 | 14 | 2178 |
| chipmunksmummy | 2 | Karen Ang Mummy to 3 chipmunks • | 965 | 11 | 2405 |
| jingxunnn | 1 | Jingxun 🌸 TO LIVE, LAUGH & LOVE * | 804 | 2 | 125 |
| thatboheme | 1 | Buckle Up Buttercup. 🎁 Founder of C | 10879 | 19 | 7416 |
| oo_foodielicious | 1 | GWENDOLYN_0.0 ୟେନ୍ଦୋଲିଞ୍ଜ ଚାଶି | 4688 | 45 | 13423 |
| emotionsbook | 1 | Library of Feelings 📚 NEW picture bc | 1747 | 3 | 443 |
| yayareayum | 1 | BAY AREA FOODIES MOVEMENT Shar | 649 | 0 | 0 |
| cassidykylanieka | 1 | CassidyKylanieka | 148 | 25 | 359 |
| liz_474 | 1 | Liz Stewart Mom 🏃 RN 🩺 Lipsense I | 3963 | 10 | 1323 |
| rasautara | 1 | Rasa Utara Berjaya Times Square, Kl | 10356 | 20 | 7438 |
| thebarrybrothers | 1 | The Barry Brothers Brothers who play | 14715 | 0 | 0 |

Figure 10: User profiling of the users who commented on Grub's posts

Based on the above results, we would like to come up with a metric that will help us determine which users are more influential than others in terms of social media, similar to the Klout scoring system. Klout calculates over 12 billion data points in 400 key areas every day. However, we do not have the time or the data required for that. Instead, we will come up with a metric that emulates Klout as much as possible, with the amount of data we have.

Here are 2 hypothetical users:

| | Number of comments | Number of followers | Number of posts in the past month | Total number of likes in the posts considered |
|---|--------------------|---------------------|-----------------------------------|---|
| A | 4 | 1000 | 5 | 500 |
| B | 1 | 4000 | 10 | 200 |

First, we will look at the how much each user interacts with Grub's content. The more a user comments on Grub's posts, the more this individual is interested in Grub. In this case, user A should be given a higher score in this component because A has commented more on Grub's posts.

Secondly, we will look at how much the user can influence their followers to react to their post.

The calculations for the above hypothetical users are shown below. In this case, user A should have a higher score for this component since a larger percentage of his followers reacted to his posts.

| Step | A | B |
|------------------------------------|-----------------------|------------------------|
| Average number of likes | $500 \div 5 = 100$ | $200 \div 10 = 100$ |
| Ratio of followers who liked posts | $100 \div 1000 = 0.1$ | $20 \div 4000 = 0.005$ |

Looking at the results for both components, the range of the first component is 1 to 2, whereas the range of component B is 0 to 0.226566179934, we will need normalize both variables so that both will have the same range. We used the z-score normalization:

$$\text{z-score} = (\text{x-mean}) / \text{standard deviation}$$

Looking at the 2 factors, we feel that the second calculation is more important than the first, and should be accorded a higher weight. This is so because no matter how interested an individual is, the outreach of the individual will be the deciding factor on how widespread Grub's related news and posts can go. As such, we assigned the first component with a weight of 1, and the second component with a weight of 1.5. The total score will then be:

$$\text{Total score} = \text{component 1} + 1.5(\text{component 2})$$

Lastly, we ordered the data frame according to decreasing total scores. Our result is shown below (Figure 11).

| userid | num_commented | description | num_followers | num_posts | total_likes | total_score |
|------------------|---------------|----------------------|---------------|-----------|-------------|-------------|
| chipmunksmummy | 2 | Karen Ang Mummy | 965 | 11 | 2405 | 9.005383 |
| conjering | 1 | ♡ jerlyn yeo ♡ how | 1306 | 7 | 1531 | 3.803642 |
| sisleyparissg | 2 | Sisley Paris (Singap | 734 | 13 | 594 | 3.463681 |
| thevilleband | 1 | The Ville Knoxville' | 584 | 13 | 952 | 2.384662 |
| messyfingers.sg | 2 | Messy Fingers SG S | 1021 | 6 | 176 | 2.333145 |
| tonyfoodsage | 2 | Tony*S 🍔 Lifestyle | 5357 | 53 | 6570 | 2.144625 |
| takagiramen | 2 | Takagi Ramen Shop | 3746 | 6 | 501 | 2.115964 |
| cassidykylanieka | 1 | CassidyKyланieka | 148 | 25 | 359 | 1.427917 |
| emotionsbook | 1 | Library of Feelings | 1747 | 3 | 443 | 1.006301 |
| mr.ctky | 1 | Celester Tan 别问我 | 5592 | 5 | 2254 | 0.874409 |
| twq89 | 1 | Scott sg DM ✕ | 4578 | 5 | 1841 | 0.868101 |

Figure 11: Results of metrics calculation

Based on the results, the influencers Grub should engage are:

1. Chipmunksmummy (rank: 1): this user is located in Singapore, and has 3 young children, 2 of which are of suitable age to join in Grub's activities for children. In addition, the user seems to enjoy taking her children out to the parks to have fun, given the pictures she has posted of her children playing at parks.
2. Messyfingers.sg (rank: 5): this user is the manufacturer of children's play dough in Singapore. Since Grub has many activities for children, having a post on Grub on this user's account may increase the public awareness of Grub.
3. Tonyfoodsage (rank: 6): this user is a foodie, judging by his posts. From the profile description, we can tell that he is the founder of a catering company in Singapore.

Users that were skipped:

| Username | Reason for rejection |
|---------------|--|
| conjering | Comment was an enquiry for Grub. Although it can be interpreted as showing interest, we are unable to tell for sure. |
| sisleyparissg | The user is a french skin-care company, and does not have any posts on food on its instagram page. |
| thevilleband | This user is not in Singapore. |

5.1.2 Facebook Influencers

Similarly, we will attempt to identify the influencers that could increase the public's awareness of Grub on Facebook. We can only consider public users, since we are unable to obtain the number of friends private users have. In addition, the calculation for facebook will be different compared to Instagram, as the data that we were allowed to collect was much lesser.

Here are 2 hypothetical users:

| User | Number of comments | Number of Facebook friends |
|------|--------------------|----------------------------|
| C | 5 | 200 |
| D | 2 | 500 |

First, similar to Instagram, we will look at the how much each user interacts with Grub's content. In this case, user C should be given a higher score in this component because C has commented more on Grub's posts. Secondly, we will look at how many Facebook friends the user has. The more friends a user has, the wider the outreach his activity on Grub's facebook page can reach.

Looking at both components (number of comments and number of Facebook friends), the range of the first component (number of comments) is 2 to 5, whereas the range of the second component (number of Facebook friends) is 200 to 500. Hence, we normalised the data, using the same formula as what was used for Instagram.

Looking at the 2 factors, we feel that the number of Facebook friends is more important than the number of comments made per user, and hence should be accorded a higher weight. This is so because no matter how many comments a user can make, even if he has a small number of Facebook friends, his activity on Grub's facebook page will not be able to attain a high outreach. As such, we assigned the first component with a weight of 1, and the second component with a weight of 1.5. The total score will then be:

$$\text{Total score} = \text{component 1} + 1.5(\text{component 2})$$

The figure below shows the total score generated (in descending order) for each of the user.

| | owner_id | num_times_commented | Number of friends | Total score |
|----|------------------|----------------------------|--------------------------|--------------------|
| 8 | Fatma Nurlaili | 2 | 658 | 3.5719157 |
| 5 | Lim Li Mei | 1 | 1030 | 1.8255422 |
| 4 | Amilyn Khoo | 1 | 953 | 1.500517 |
| 1 | Krista Gomez | 1 | 861 | 1.1121753 |
| 9 | Beatrice Wong | 1 | 850 | 1.0657432 |
| 0 | Rachel Tan-Hwee | 1 | 460 | -0.5804881 |
| 7 | Wiz-kelyfa Young | 1 | 290 | -1.298076 |
| 2 | Eileen Teo | 1 | 230 | -1.5513424 |
| 3 | JesLyn Tan | 1 | 221 | -1.5893323 |
| 6 | Julene Aw | 1 | 208 | -1.6442067 |
| 10 | 彩萍 | 1 | 26 | -2.4124479 |

Figure 12: Results of the metrics calculation

Based on the total score, the top 3 influencers that Grub should engage are:

1. Lim Li Mei (rank 2): Scrolling through this user's Facebook page, we could characterise her as a family-oriented person, and a foodie. She has 2 young children who are of suitable age to join Grub's activities for children.
2. Amilyn Khoo (rank 3): Based on the posts she made, this user is a foodie, and is someone who likes to explore new places.
3. Rachel Tan-Hwee (rank 6): this user has many photos of her family on Facebook, and seems to like the outdoors.

Users that were skipped:

| Username | Reason for rejection |
|----------------|---|
| Fatma Nurlaili | This user does not seem to live in Singapore. |
| Krista Gomez | This user lives in Philippines.. |
| Beatrice Wong | This user does not seem to have any photos of food or parks on her Facebook feed. |

5.2 Hashtags Analysis

From the 100 facebook and instagram posts, we retrieved all the unique hashtags that has been used by Grub.

5.2.1 Instagram

For instagram, the 2 reactions we will be looking at are likes and comments. To have a quantitative analysis, we assigned a weight to each of the reactions, as shown below. The weights were decided based on the frequency and significance of the reaction. In this case, getting a comment is more significant than a “like”. It also occurs at a lower frequency.

| Reaction | Weight |
|----------|--------|
| Like | 1 |
| Comment | 1.5 |

Hence, we used this formula to quantify the reactions:

$$\text{Avg. weighted reaction} = (\#\text{likes} + 1.5 * \#\text{comment}) / \#\text{occurrence}$$

The bar chart below is the result of the analysis:

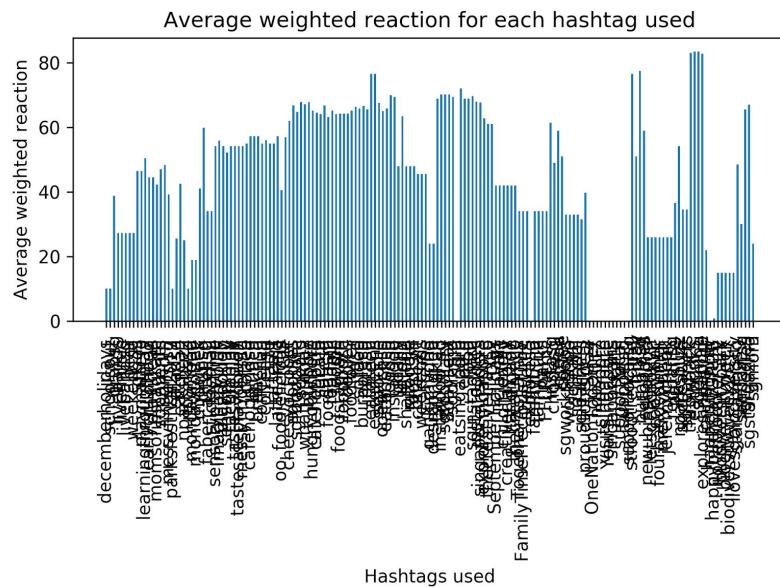


Figure 13: Average Weighted Reaction for Each Hashtag Used

There are too many hashtags that were used, so we had to narrow down to the top 30. The results are shown below.

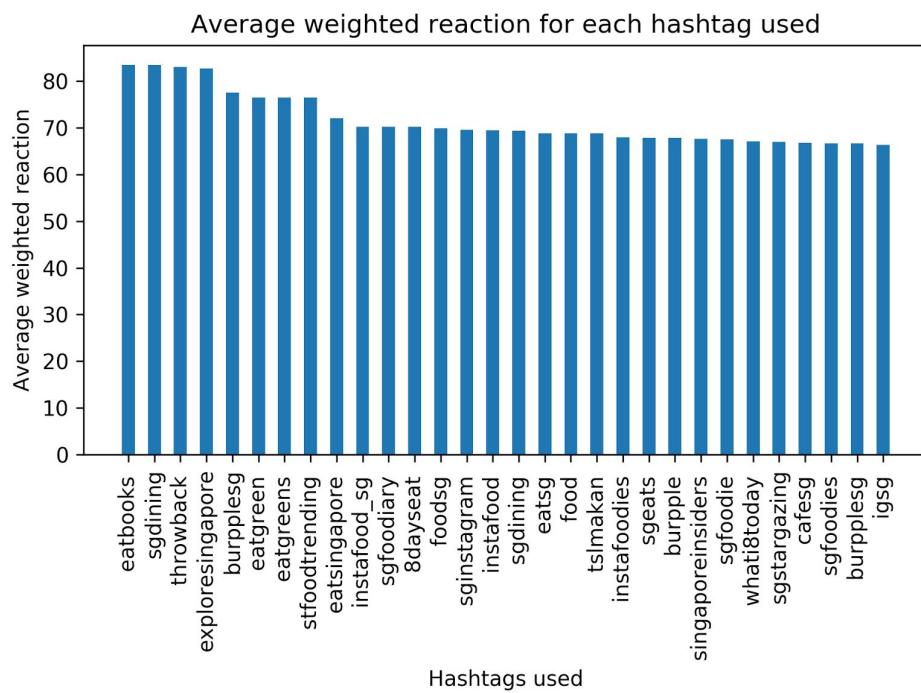


Figure 14: Average Weighted Reaction for Each Hashtag Used

From the results, it seems that the top 3 hashtags that garnered reactions on Instagram are: #eatbooks, #sgdining and #throwback. Hence, we suggest the Grub use these hashtags more often.

5.2.2 Facebook

For facebook, users have 6 emotional reactions to choose from: loves, likes, wow, haha, sad and angry. Other than the 6 emotional reactions, commenting and sharing of posts are considered as well. Similar to Instagram, we have assigned a weight to each of the reactions, as shown below.

| Reaction | Weight |
|----------|--------|
| Like | 1 |
| Love | 2 |
| Wow | 2 |
| Haha | 1 |

| | |
|---------|-----|
| Sad | -2 |
| Angry | -2 |
| Comment | 1.5 |
| Share | 2 |

To calculate the average weighted reaction for each hashtag, we used the formula as shown below:

$$\text{Avg. weighted reaction} =$$

$$\frac{[2 * (\#loves + \#wows) + \#haha + \#likes - 2 * (\#sad + \#angry) + 1.5 * \#comment + 2 * \#share]}{\#occurrence}$$

As evident from the figure below, the top 3 hashtags that have garnered the highest weighted reaction are #throwback and #proudtobelocal and #SG52. Therefore, we suggest that Grub could make use of these 3 hashtags more frequently when they are posting on their facebook page. This can help to increase their outreach to more people in Singapore.

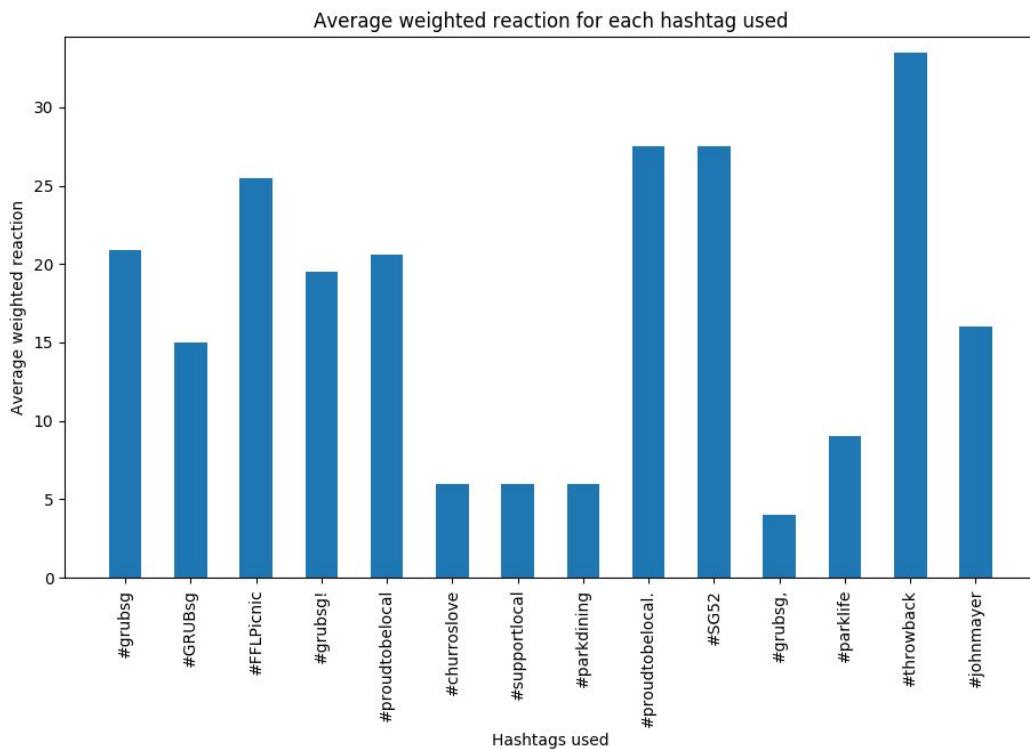


Figure 15: Average Weighted Reaction for Each Hashtag Used

5.3 Competitor Analysis

5.3.1 Word Cloud

We used a wordcloud to identify the words that are used more frequently, for both grub and its' competitors. The method that we used is similar to what we have learnt from the class.

Wordcloud for Grub:



There are few trends that we observed:

1. The reviews highlight the key location and environment characteristics of the restaurants such as “Park”, “quiet”, and “cafe”
 2. The reviews have large amount of association towards the food that restaurants offer such as “Burger”, “churro”, “fries”, and “wafe”.
 3. The distinct adjectives used are positive: “good”, “great”, and “lovely”.
 4. The aspects which most people talk about are “service”, “tastes”, “staff”, “price”, and “location”.

Wordcloud for Canopy Garden:



The general consensus about Canopy Garden is:

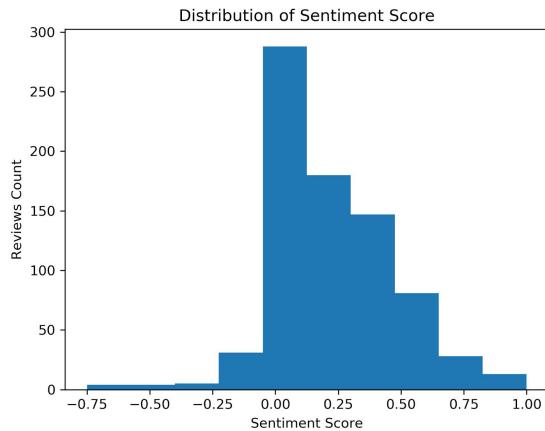
1. The public opinion of Canopy Garden seems to be positive, with words like “good” and “great” and “nice” standing out.
 2. There is not one dish that is prominent.
 3. The most talked about aspect is the “service”.

Wordcloud for The Workbench Bistro:

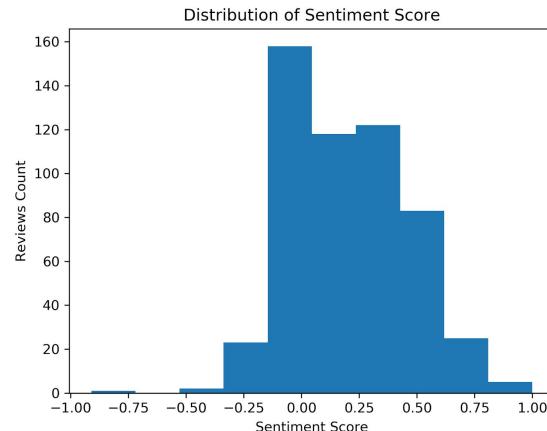


5.3.2 Sentiment Analysis

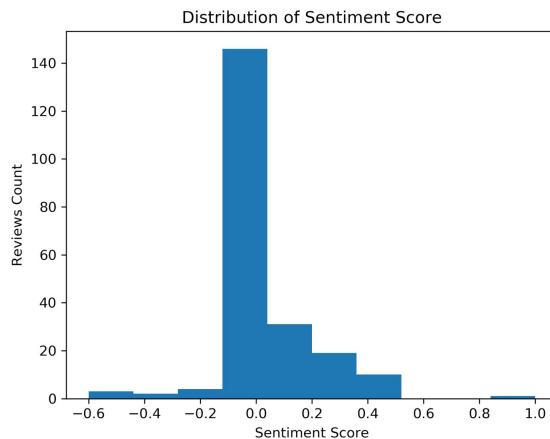
Grub



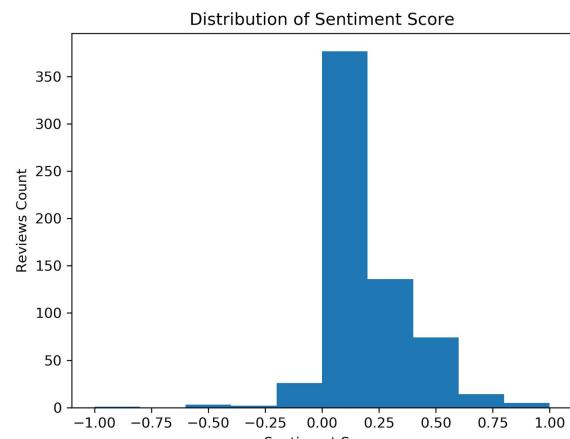
Canopy Garden



The Workbench Bistro



Fatboys



Comparing the distribution of sentiment scores, the insights that we got are:

1. The workbench Bistro has a lot more negative reviews than positive. This is the worst performing cafe out of the 4 shown above.
2. Despite having a significant proportion of reviews that are negative, Canopy Garden has a larger proportion of more positive reviews (0.25 to 1) as compared to Grub.
3. Grub has a slightly higher proportion of negative reviews than Fatboys. However, it also has a higher proportion of positive reviews than Fatboys. This is because most of the reviews for Fatboys tend to be more neutral (-0.25 to 0.25), whereas the reviews for Grub tends to be more positive (0.25 to 1).

6. Recommendations

6.1 Influencer Identification

Engaging the right influencers will help increase public awareness of Grub. Based on our analysis, the suggested users Grub could reach out to are:

| Instagram | Facebook |
|-----------------|-----------------|
| Chipmunksmummy | Lim Li Mei |
| Messyfingers.sg | Amilyn Khoo |
| Tonyfoodsage | Rachel Tan-Hwee |

The users we have identified here are not the famous influencers in Singapore. Rather, we focused on users that had an existing connection with Grub, either through Facebook or Instagram.

6.2 Hashtag Analysis

Using the right hashtag will lead to an increase in public's awareness of Grub, which may translate to new faces for the business. Based on our analysis, we suggest that Grub increase the usage of the hashtags as shown below:

| Instagram | Facebook |
|------------|-----------------|
| #eatbooks | #throwback |
| #sgdining | #proudtobelocal |
| #throwback | #SG52 |

Based on our analysis, we can only tell which hashtags seem to produce the most reaction. However, we are unable to tell if changing the hashtags will help increase the reaction counts, due to the many factors that contribute to it. Instead of sticking to the same hashtags, we suggest that Grub experiments with the hashtags that they use. This will then give us a definite answer to see if certain hashtags will help increase public awareness of Grub.

6.3 Competitor Analysis

Based on the wordcloud and sentiment analysis, it seems that Grub is doing well compared to its competitors. Like its competitors, Grub's dishes are quite distinct on the word cloud.

Grub is unique in the sense that it offers activities to children twice a month and has regular live performances. However, this does not seem to be reflected in the wordcloud. Hence, Grub could try to increase the public's awareness of their activities. Should they be successful in getting more people to talk about their activities, it would be a significant unique attraction that its competitors do not have.

7. Limitations

7.1 Private Accounts

For Instagram, we are unable to scrape the data of private users. Similarly for Facebook users, we are unable to get the number of friends that private users have. Hence, even if they have a large number of people following them, we cannot include them in the identification of Instagram influencers. This reduces our pool of users that Grub can approach.

7.2 Constraint of Facebook Graph API

Although we retrieved data from the Facebook Graph API, there are restrictions on the data we can collect. For example, we are unable to retrieve the number of friends public users have. Also, we could only get Grub's last 100 posts.

7.3 Limited Number of Online Reviews

Although we gathered total of 2172 food reviews from the 4 websites for Grub and its competitors, but the general length of the food review are relative shorter compare to articles. Hence, it created the limitation for the LDA model to predict a more accurate topics clustering.

8. Technologies, Tools and Methods

| | |
|----------------|--|
| IDE | PyCharm |
| Packages | Pandas, selenium, bs4, time, datetime, re, calendar, lxml, html5lib, openpyxl, gensim, matplotlib, collections, numpy, scipy, requests |
| APIs | Facebook Graph API |
| Visualisations | Word cloud, histogram, bar charts |
| Data Storage | Excel |
| Others | ChromeDriver |

9. Team Contributions

| | Task | Contributor |
|-----------------|----------------------|-------------|
| Data Collection | Facebook | Hui Yee |
| | Instagram | Amelia |
| | Yelp, HungryGoWhere | Austin |
| | Burpple, TripAdvisor | Liang Wei |

| | | |
|--------------|---------------------------|-------------------------|
| Analysis | Influencer Identification | Amelia, Hui Yee |
| | HashTag Analysis | Amelia, Hui Yee |
| | Competitor Analysis | Liang Wei, Austin |
| Deliverables | Report | Amelia, Hui Yee |
| | Slides | Amelia, Austin, Hui Yee |
| | Poster | Austin |

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11. Appendix

11.1 Latent Dirichlet allocation (LDA)

Our team attempted to utilise Latent Dirichlet allocation (LDA) to analyze the data scraped from the food review websites. However, the model did not produce any significant findings. Hence, this analysis was not included in the main part of the report.

LDA is a generative statistical model that allows sets of observations to be explained by unobserved groups that explain why some parts of the data are similar. In our competitor analysis, we grouped all the review comments from the 4 different websites and use the LDA to classify them into different topic group. We are using a 2 words cluster with top 6 topics and 3 words cluster with top 4 topics.

Grub

| Topic | Word 1 | Percentage | Word 2 | Percentage |
|-------|--------|------------|--------|------------|
| 1 | food | 0.019 | good | 0.016 |
| 2 | burger | 0.020 | fish | 0.009 |
| 3 | burger | 0.015 | fry | 0.012 |
| 4 | burger | 0.010 | park | 0.009 |
| 5 | burger | 0.021 | food | 0.013 |
| 6 | pasta | 0.011 | crab | 0.010 |

| Topic | Word 1 | Percentage | Word 2 | Percentage | Word 3 | Percentage |
|-------|---------|------------|--------|------------|--------|------------|
| 1 | burger | 0.019 | pasta | 0.010 | fry | 0.010 |
| 2 | churros | 0.011 | grub | 0.009 | fry | 0.009 |
| 3 | food | 0.029 | good | 0.023 | park | 0.013 |
| 4 | burger | 0.012 | like | 0.008 | fish | 0.006 |

The following patterns can be observed:

1. The topics with highest percentage are “burger, food” & “food, good, park”
2. “Burger” is one of the highest occurring words among all topics

3. Users tend to comment on the topic ‘crab pasta’, which is one of Grub’s top selling items. However, the other top selling item that mentioned by Grub like ‘churros’ is less commented by customers
4. “Food, good, park”: Customers have a positive sentiment for Grub’s location and food.

The Workbench

| Topic | Word 1 | Percentage | Word 2 | Percentage |
|-------|--------|------------|--------|------------|
| 1 | waffle | 0.022 | cream | 0.016 |
| 2 | taste | 0.016 | waffle | 0.013 |
| 3 | cafe | 0.017 | waffle | 0.008 |
| 4 | cafe | 0.012 | food | 0.010 |
| 5 | waffle | 0.014 | pasta | 0.014 |
| 6 | waffle | 0.025 | egg | 0.016 |

| Topic | Word 1 | Percentage | Word 2 | Percentage | Word 3 | Percentage |
|-------|--------|------------|--------|------------|--------|------------|
| 1 | staff | 0.017 | waffle | 0.010 | cafe | 0.010 |
| 2 | waffle | 0.017 | cafe | 0.014 | ice | 0.011 |
| 3 | waffle | 0.014 | fry | 0.008 | wing | 0.008 |
| 4 | waffle | 0.019 | good | 0.011 | egg | 0.011 |

The following patterns can be observed:

1. The waffles are the most popular online
2. The other popular items are the “ice cream” and “egg”.

Canopy Garden

| Topic | Word 1 | Percentage | Word 2 | Percentage |
|-------|--------|------------|--------|------------|
| 1 | good | 0.014 | food | 0.013 |

| | | | | |
|---|-------|-------|-------|-------|
| 2 | place | 0.019 | food | 0.017 |
| 3 | main | 0.009 | food | 0.008 |
| 4 | u | 0.029 | thank | 0.023 |
| 5 | dish | 0.008 | egg | 0.008 |
| 6 | food | 0.024 | staff | 0.014 |

| Topic | Word 1 | Percentage | Word 2 | Percentage | Word 3 | Percentage |
|-------|--------|------------|---------|------------|--------|------------|
| 1 | food | 0.016 | service | 0.010 | egg | 0.010 |
| 2 | food | 0.012 | like | 0.007 | good | 0.007 |
| 3 | good | 0.018 | food | 0.017 | park | 0.010 |
| 4 | u | 0.025 | thank | 0.017 | look | 0.015 |

There are no significant observable patterns for Canopy Garden.

Fatboys

| Topic | Word 1 | Percentage | Word 2 | Percentage |
|-------|--------|------------|--------|------------|
| 1 | burger | 0.023 | great | 0.011 |
| 2 | burger | 0.037 | good | 0.011 |
| 3 | burger | 0.033 | fry | 0.017 |
| 4 | burger | 0.044 | good | 0.010 |
| 5 | burger | 0.021 | food | 0.018 |
| 6 | burger | 0.053 | cheese | 0.014 |

| Topic | Word 1 | Percentage | Word 2 | Percentage | Word 3 | Percentage |
|-------|--------|------------|--------|------------|--------|------------|
| 1 | burger | 0.050 | cheese | 0.011 | place | 0.010 |
| 2 | burger | 0.041 | great | 0.012 | place | 0.008 |
| 3 | burger | 0.036 | fry | 0.016 | good | 0.015 |

| | | | | | | |
|---|--------|-------|-----|-------|-----|-------|
| 4 | burger | 0.030 | bun | 0.010 | fry | 0.008 |
|---|--------|-------|-----|-------|-----|-------|

The following patterns can be observed:

1. Since Fatboys specialises in burgers, having the keyword “burger” appear so frequently is not unexpected.
2. The reviews on burgers are mostly positive.
3. The cheeseburgers seem to be the most popular items online.

Although some trends may be observed from the individual LDA models, there are no significant results. This is likely due to the number of reviews being too small for LDA to produce significant results.