AMAZON REVIEWS TEXT

ANALYTICS

TEXT UNICORNS

Harshini Chepyala
Rajkumar Selvam
Soumya Shalini
Varun Patwardhan

Submitted on : 05-04-2018

B-1. Introduction

B-1.1 Description about competitors

Apple Inc. is an American multinational technology company headquartered in Cupertino, California, that designs, develops, and sells consumer electronics, computer software, and online services. The company's hardware products include the iPhone smartphone, the iPad tablet computer, the Mac personal computer, the iPod portable media player, the Apple Watch smartwatch, the Apple TV digital media player, and the HomePod smart speaker. Apple's software includes the macOS and iOS operating systems, the iTunes media player, the Safari web browser, and the iLife and iWork creativity and productivity suites, as well as professional applications like Final Cut Pro, Logic Pro, and Xcode. Its online services include the iTunes Store, the iOS App Store and Mac App Store, Apple Music, and iCloud. The iPhone 6 is a smartphone designed and marketed by Apple Inc.[4]

Samsung is a South Korean multinational conglomerate headquartered in Samsung Town, Seoul. It comprises numerous affiliated businesses, most of them united under the Samsung brand, and is the largest South Korean chaebol (business conglomerate).Samsung was founded by Lee Byung-chul in 1938 as a trading company. Over the next three decades, the group diversified into areas including food processing, textiles, insurance, securities and retail. Samsung entered the electronics industry in the late 1960s and the construction and shipbuilding industries in the mid-1970s; these areas would drive its subsequent growth. Following Lee's

death in 1987, Samsung was separated into four business groups – Samsung Group, Shinsegae Group, CJ Group and Hansol Group. Since 1990, Samsung has increasingly globalised its activities and electronics ; in particular, its mobile phones and semiconductors have become its most important source of income. As of 2017, Samsung has the 6th highest global brand value.Notable Samsung industrial affiliates include Samsung Electronics (the world's 2nd largest information technology company measured by 2015 revenues, and 5th in market value), Samsung Heavy Industries (the world's 2nd largest shipbuilder measured by 2010 revenues), and Samsung Engineering and Samsung C&T (respectively the world's 13th and 36th largest construction companies). Other notable subsidiaries include Samsung Life Insurance (the world's 14th largest life insurance company), Samsung Everland (operator of Everland Resort, the oldest theme park in South Korea) and Cheil Worldwide (the world's 15th largest advertising agency measured by 2012 revenues)[3]

BLU Products, an American company is headquartered in Miami, BLU designs and manufacturers affordable, attractive and innovative mobile devices focusing on fulfilling the needs of the everyday person. BLU is pioneering the advancement of the prepaid and no-contract revolution, giving consumers a choice between GSM network providers. In the beginning, BLU provided a vast portfolio of unlocked mobile phones to thousands of dealer agents, MVNO's, and large retailers throughout the United States, such as Amazon, Walmart, Best Buy, Brandsmart and B&H Caribbean, Latin America, Europe and Asia. Now with a new Hong Kong distribution center, BLU is known as a global brand. With an emphasis on giving what today’s mobile users need, and always launching new models, BLU gives consumers the option of an affordable

smartphone at a low price point without sacrificing fashionable design and quality. BLU continues growing at a rapid pace fueling passionate followers and fans throughout the world.

B-1.2 Interesting Facts about Amazon

Almost 90% of consumers consider online reviews highly important when purchasing a product from unfamiliar brand. Even when purchasing from known brand, 67% of women consumers still mostly consider online reviews. Amazon is topmost site for reviews, 90% of amazon consumers consider online reviews determinative. For the 43% of consumers who check online reviews for items they've purchased before, they do so to see if others have had a similar experience and also to see if there is a better product option. Moreover, consumers consider themselves savvy discerners of reviews, with 97% saying they can tell almost all of the time the credibility of a posted review. 3 key determinants of trust for an online review: how much the person sounds like me, amount of detail in the review, and noted as a verified purchaser.

B-1.3 Amazon Reviews Insights

Manufacturer's can make use of insights from reviews in order to:

- Monitor the negative topics discussed about the products
- Find the features of their products which are most attractive
- Check the market perception differences in comparison to competitors
- Check the market opportunities for new features for further product innovation
- Check the fitness of their product segments with market segment

The above analysis can provide quantifiable metrics which can be used in further downstream

applications for tracking real- time perception and trends. We focused on one particular category for reviews: Mobile Phones. We focused in particular on Unlocked models as they are mostly sold on Amazon.

B-2. Research Problems:

Below are our main research objectives:

- Find common topics discussed for unlocked mobile phones
- Explore the differences in the focal topics for low and high rated reviews
- Explore the differences in topics for different manufacturers
- Explore the differences in products with 4.0 and 5.0 ratings as this serves interesting insights for manufacturers
- Check the impact of influence of specific topics on overall rating
- Perform sentiment analysis for reviews with specific topics to see overall perception about particular product features

B-3. Analysis Methods and Results:

B-3.1 Data Description and Preprocessing:

We scraped review data from amazon.com for popular unlocked phones. We used a python package BeautifulSoup to build our script for web scraping:

- Apple iPhone 6 Unlocked Smartphone, 16GB

- Blu Vivo XL2 - 5.5" 4G lte GSM
- Samsung Galaxy S7 G930F

Data Features :

Product_Name, Review_Date, Rating_Out_Of_5, Review_Title, Review_Text

Data Preprocessing:

For feature extraction we aimed to derive major **entities**, **themes**, **categories**, **intentions**, **themes** and **sentiments** from customer reviews for each selected brand.
The preprocessing steps involved: Tokenization, Stop Words Removal, Stemming and Lemmatization. The clean dataset was further used for term frequency calculation, TF-IDF calculation, extraction of most frequent bigrams and Parts of Speech(POS) Tagging.
POS Tagging was used to get important nouns and adjectives from the reviews which were used as terms for building our topics list for text categorization.

B-3.2 Exploratory Analysis:

As a part of initial exploration following methods were used , which also involved visualizations through graphs and word clouds :

- **TF vs TF-IDF Analysis** to find most distinguishing terms discussed across all reviews(As shown in Exhibit 3 and 4)
- **Text Clustering** to discover naturally occurring groupings of reviews, and thus be able to derive meaningful underlying themes and entities
- **Topic Modeling** to get insights from machine generated topics among reviews

This exploration was used to identify the most discussed terms and topics among reviews and simultaneously check the validity of the terms identified by machine generated topics through Topic modeling. The results were used for downstream analysis methods.

B-3.2.1 Visualizations and word clouds

As per the visualization in “Exhibit 1”, it was observed that reviews with rating 3 have maximum length overall. This seems natural as reviewers leaving this particular rating tend to be more meticulous. This indicates that we should not ignore these reviews while doing separate analysis of “Good” vs “Bad” rated reviews. For this reason, it was decided to segregate the reviews based on sentiment scores (“Exhibit 2”) as well in addition to the separate analysis done for reviews with 1 and 2 ratings(“Good”) vs those with 4 and 5 ratings (“Bad”). It appears that “BLU” phones have higher sentiment scores than other two brands. This is because users of this brand tend to not expect really good performance for the price they have paid. However, they tend to talk more positively as the phone is exceeding their expectations.

B-3.2.2 TF vs TF-IDF Analysis

This analysis was done to evaluate how important a word is to a review across the whole corpus. Using “Exhibit 3”, we could identify top-25 most frequent words in reviews of all phones and individual phones. Some terms like ‘phones’, ‘samsung’, ‘blu’, ‘apple’ etc which are mostly used in reviews but do not give much value , were considered as stop words and thus, removed. Terms like ‘price’,‘money’ ,‘fast’ ,‘sim’ were identified as a frequent word only in Blu phones . Similarly, ‘camera’ is frequently discussed in Samsung reviews and ‘issue’, ‘charger’ etc in iphone. Terms like ‘battery’, ‘screen’, ‘time’ etc were discussed for all phones.

B-3.2.3 Text Clustering and Unsupervised Categorization

Cluster Analysis was performed with 5 clusters. The optimal number resulted to be 5 after analyzing the terms and RMSSTD describing distinct clusters.

With the help of the below table and word clouds in “Exhibit 5”, we could create cluster themes.

Cluster	Cluster Themes	Cluster Description	Freq	Percent	RMSSTD
1	Good perception on phone accessories	+card sim international +'sim card' +unlock +version sd +carrier +expect awesome +thing +memory battery +amaze far	341	15.71	0.122003819
2	Feature Satisfaction	+love +product great excelent +'great product' excelente 'excellent product' excellent +happy +recommend 'on time' +work +phone perfect +satisfy	232	10.69	0.119538706
3	Problems arising with time	+work +buy +problem +month +charge +return working +time +day +turn +battery money +issue +receive +start	583	26.87	0.124601225
4	Overall Product Satisfaction	+phone +good +great price +'great phone' excellent +'good phone' +nice quality +camera +fast +perfect awesome +memory +condition	455	20.97	0.120355803
5	Neutral or bad perception on features and accessories	+apps +case blu +screen +drop back +year +want sd +camera +service first +update	559	25.76	0.134822845

In order to further identify topics discussed and similar patterns in each identified cluster, the data set was split cluster wise and topic modeling was performed for each cluster .

E.g. in Cluster 3, reviews are mostly regarding “Problems arising with time”. This was explained more by machine generated cluster topics like “+stop,working,+month,turn on,apple” , “ +screen, touch, +problem, +phone, +return” , “+battery, +die, +hour, +charge,less” , “money, waste, +month, +want, +return” etc. Similarly in Cluster 2, due to good feature satisfaction , reviewers discuss on topics like “+love,+phone,daughter,brand,+work,recommend” ,

“ great product, great, +product, far, +problem”, “Great,+work,+arrive,far,delivery” etc .

We also explored these cluster themes separately for different brands as shown in “Exhibit 6”

B-3.2.4 Topic Modeling (Latent Dirichlet Allocation):

We used the reviews for all three manufacturers and generated machine topics using LDA for these reviews. These reviews were combined as a single corpus of documents so that the generated topics will not be biased towards particular manufacturer or phone. We ran the LDA model to generate different number of topics and finalized this number to be 10 at which, the topics demonstrated highest clarity and atomicity through the terms representing them. These topics as well as terms was input for downstream analysis for text categorization using custom list of terms for user topics.

B-3.3 Text Categorization

We created a list of 886 terms to describe 10 user defined topics, as shown in "Exhibit 7".

Accessories	Look and Feel	Sim and SD card
Camera	Price	Performance
Connectivity	Problems arising with time	
General Good Perception	Service	

This list was created by carefully looking into machine generated topics and by manually cross validating whether these terms indeed represented the topic using our initial exploration accomplished using text clustering and TF-IDF analysis.

An ontology was identified among these topics and our list of terms was managed accordingly. E.g. "Connectivity" was considered as sub-topic of performance. Clustering of reviews was

also implemented based on topic weights to analyze the relation of products with market segmentation. Along with these, the topic differences were compared between reviews with 4.0 and 5.0 rating for each product as well as between low rated and high rated reviews (as shown in "Results" Section). In addition, the differences in topic and how they compare for each product were analyzed.

B-3.4 Sentiment Analysis

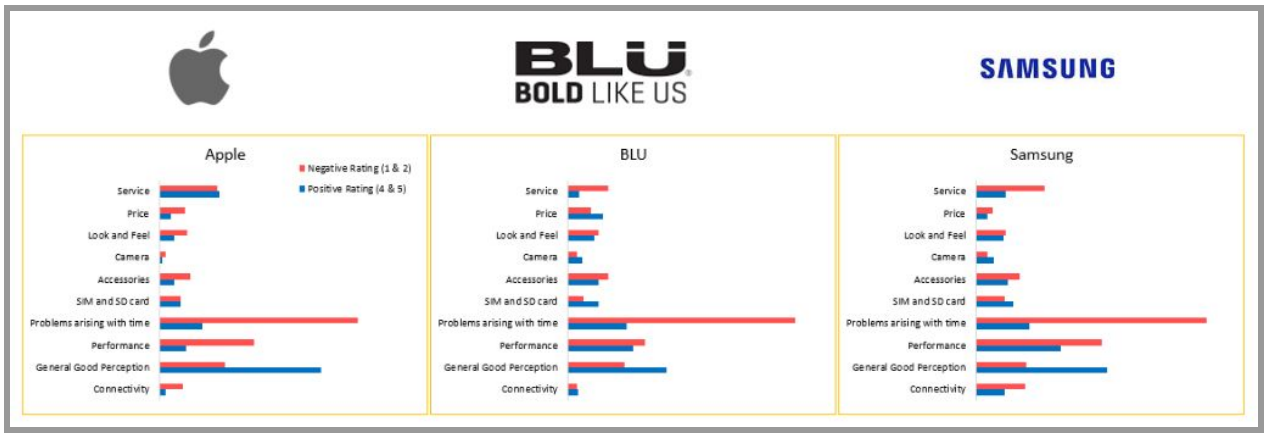
Sentiment Analysis of all reviews was performed to quantify the overall perception and also perception about particular attributes of the products based on the topics. Primary reason for this was to not lose the content of reviews with rating of 3 . Also, from "Exhibit 4", we could see that reviews cannot be categorized as good or bad based on Reviews Ratings or Sentiment Scores only , becauses some reviews have good rating but still have low sentiment score and vice versa. Hence, we have considered both Ratings and Sentiment Scores for our analysis.

B-3.5 Regression Analysis

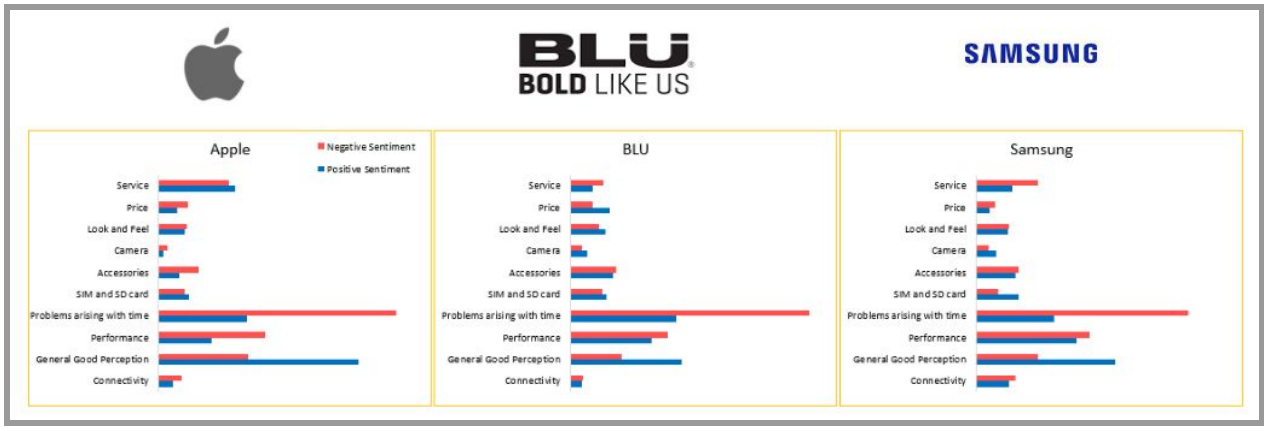
Regression analysis was done to check the impact of of topic weights on overall rating. This also served as a measure of quality of our manually prepared list of terms. We had R^2 metric of 0.31 signalling decent goodness of fit for our model explaining the overall rating using topic weights.

B- 3.6 Results

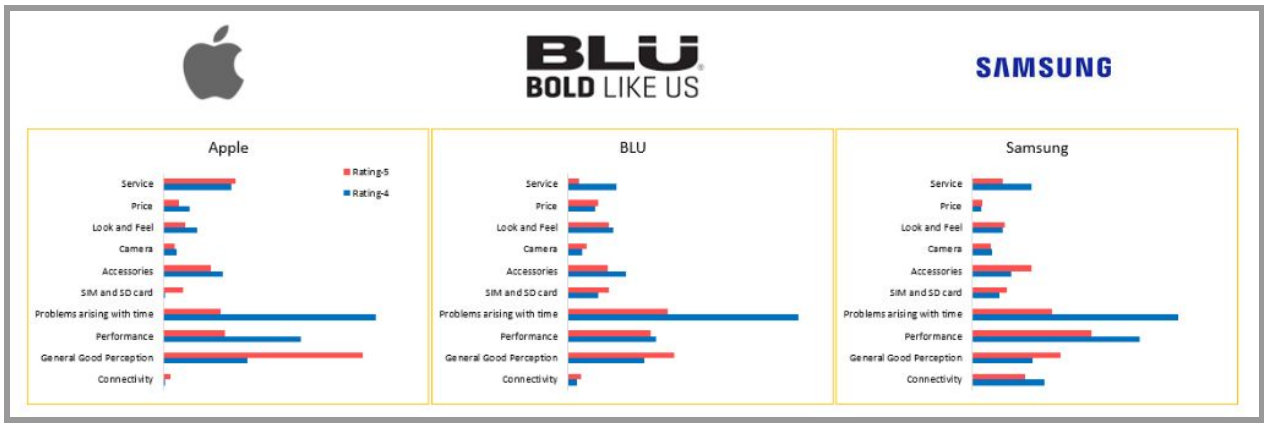
B-3.6.1 Positive vs Negative - Customer Rating Approach



B-3.6.2 Positive vs Negative - Sentiment Score Approach



B-3.6.3 Comparison between Ratings-4 and Ratings-5



B-3.6.4 Results of Regression Analysis:

When we performed regression analysis to check the influence of topic weights on the review rating, we found below topics have significant impact on rating:

1. **Connectivity**: This topic is described terms which specify the phone's compatibility with different carriers internationally. Mention of this topic in reviews had significant negative impact on overall rating
2. **General Good Perceptio**n: This topic is described terms which specify general good remarks about the phone and discuss overall perception. Mention of this topic had significant and highly negative impact on the rating
3. **Performance**: This topic is described terms which specify overall performance of the phone (Speed, compatibility, features etc.)Mention of this topic had significant positive impact on the overall rating
4. **Problems arising with time**: This topic is described terms which specify the diverse

problems encountered over time with phone use.Mention of this topic had very highly significant negative impact on overall rating

5. **Service**: This topic is described terms which specify overall service quality this includes customer service and continued support by product manufacturer. Mention of this topic had significant negative impact on overall rating
6. **Price**: This topic is described terms which specify comments about price or perceived value of money for the product. Mention of this topic had significant positive impact on overall ratings.

B-3.6.5 Observations from Overall Perception of Customers:

1. Apple pushes comparatively more frequent s/w updates. So people talk more about it, but overall have good perception about it
2. iPhone users are very sensitive and reactive even when there are minor issues, as their expectations are very high for the price they paid.
3. Samsung has too many bloatwares and the software updates are causing more issues.
4. For Blu, people are satisfied with price resulting in a positive perception, as compared to Samsung and iphone.
5. Blu customers are comparatively more satisfied with the features like camera, accessories, etc. due to their minimal expectations

B-4 Business/Marketing Strategy Recommendations and Limitations :

B-4.1 Rationale behind Recommendations:

1. Monitor reviews associated with problems arising with time topic and use the feedback to improve the product.
2. Focus on the differences in the topics and sentiment in 4 and 5 rated reviews to understand customer satisfaction and areas of improvement. Do the similar analysis for competitors as an input for SWOT analysis
3. Focus on 1 and 2 rated reviews to understand features with negative reception by market
4. Verify that the market positioning strategy they have decided is reflected in the reviews

B-4.2 Recommendations to improve customer ratings from 4 to 5:

1. Improvement in modules that fails over the time will improve the customer ratings for all phones.
2. Improvement in performance of the phone will improve the customer ratings for Apple phones
3. Improvement in after-sales service, warranty services, consistent performance over time will improve the customer ratings for Blu phones
4. Samsung phone customer ratings will be improved by following changes.
    - Improvement in performance of the phone

- Introduce the ability for customers to remove unwanted bloatware
- Being more transparent/clear about different versions like International, US, etc

B-4.3 Recommendations to improve overall customer satisfaction and sales:

1. iPhone users are extremely sensitive to issues they encounter. Smoother after-sales services like warranty, software updates, etc. will have a significant impact on sales
2. Being more transparent/clear about different versions like International, US, etc
3. Improvement in consistent device performance avoiding the problems over time
4. Providing the ability for customers to remove unwanted bloatware

C. References:

[1] Debroff, Stacy , 2017, February 22. General format. Retrieved from https://www.business.com/articles/7-surprising-ways-online-reviews-have-transformed-the-path-to-purchase/

[2]http://influence-central.com

[3]https://en.wikipedia.org/wiki/Samsung

[4]https://en.wikipedia.org/wiki/Apple_Inc.

[5]https://www.amazon.com/BLU-VIVO-XL2-Unlocked-Smartphone/dp/B01NBNCDCB

[6]https://www.slideshare.net/0xdata/h2o-world-clustering-feature-extraction-on-text-seth-redmore

[7]https://www.ncrypted.net/blog/how-does-amazon-work-insights-into-business-model-and-rev

enue-analysis/

[8]https://reviewmeta.com/blog/analysis-of-7-million-amazon-reviews-customers-who-receive-free-or-discounted-item-much-more-likely-to-write-positive-review/

D. Appendices:

Exhibit 1: Review length vs Rating

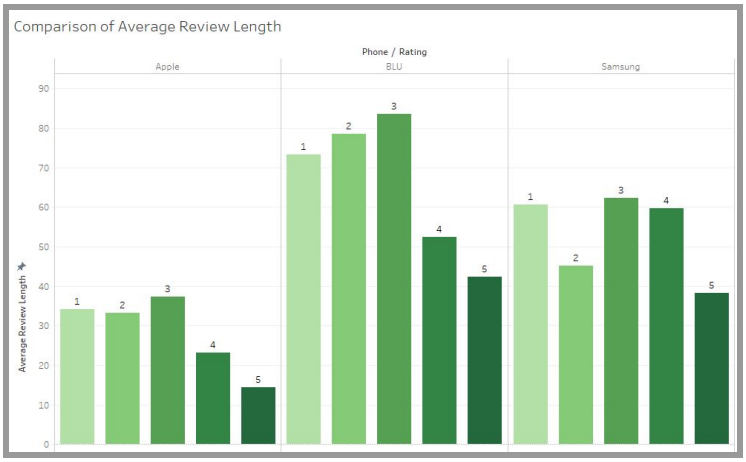


Exhibit 2: Average Sentiment Score vs. Brand

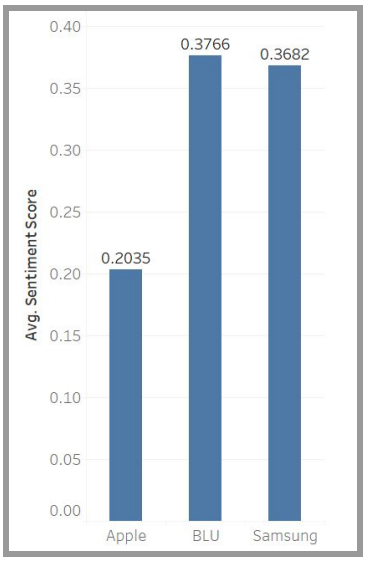


Exhibit 3: Comparison between tf-idf scores of Top 25 features under each category

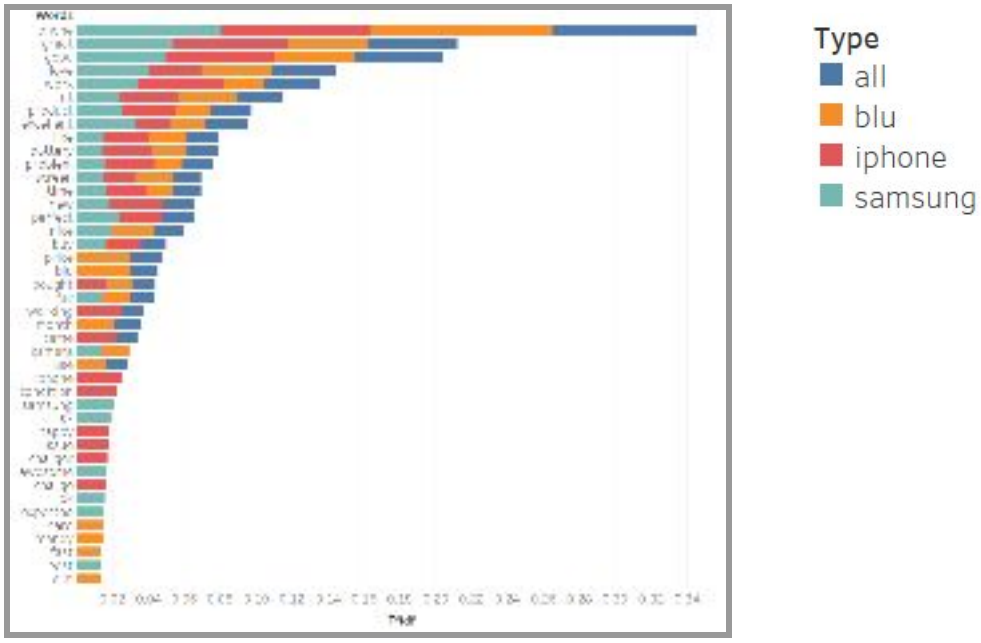


Exhibit 4: Comparison between Sentiment scores and Review Ratings

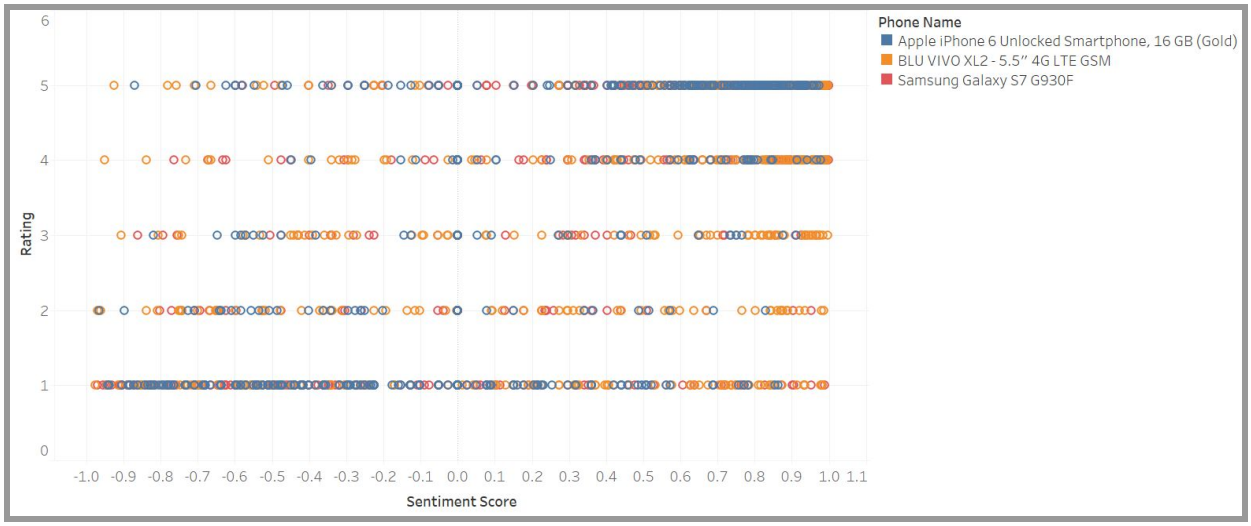


Exhibit 5: Analysis and Visualization of TF and TF-IDF to identify the initial user topics

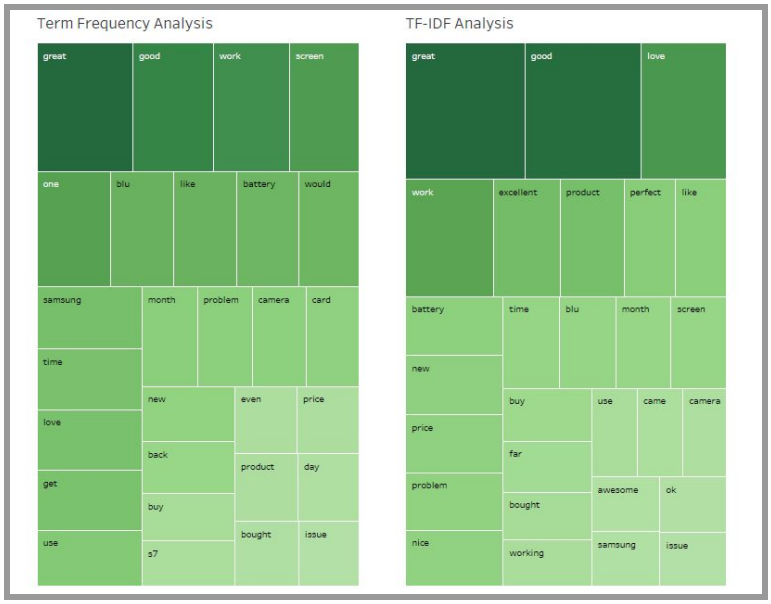


Exhibit 6: Themes using word clouds for Cluster 1 - 5

Exhibit 7: Themes using word clouds for Apple , Samsung, Blu

Exhibit 8: Snapshot of manually generated topic list for Text Categorization

Accessories	Camera	Connectivity	General Good Perception	Look and Feel
headphone	camera	unlock	good	color
adapter	picture	version	good product	gold
cover	photo	international	product	water proof
protector	megapixel	international version	perfect	sleek
jack	selfies	carrier	love	slim
socket	image	lock	good phone	metal
charger	mp	country	perfect condition	waterproof
dual sim	picture quality	sim	excellent	solid
chip	shot	adapter	great	silver
sticker	shoot	american	work	slippery
gorilla	camera quality	gsm	look	display

Performance	Price	Problems Arising with time	Service	Sim and SD card
video	price	problem	scratch	card
connect	budget	time	delivery	sim
memory	cost	issue	broken	sim card
4g	costly	screen	box	sd
3g	money	start	package	memory card
bluetooth	cheap	turn on	damage	slot
wireless	cheaper	freeze	damaged	tray
wifi	sale	return	late	unlock
signal	savings	update	lost	micro
range	$	restart	warranty	fit
network	dollar	year	perfect condition	gb