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Sentiment Analysis Evaluating the Brand Popularity of Mobile Phone by Using Revised Data Dictionary

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Abstract : *Today We Are Living In An Era Of Social Media Explosion Where People Are Connected Across The Globe For Entertainment Purpose, Providing Their Reviews On Matter Like Politics, Movies, Celebrities Etc. Organizations/Industries Can Predict Market Behavior As Well As The Requirements Of The User Based On The Opinion Provided In The Form Of Posts By The People. It Will Help In Both The Economic Growth And In The Research Zone. Sentiment Analysis Is The Study That Analyzes People Opinion And Sentiment Towards Entities Such As Product, Services Etc. With The Rapid Proliferation Of Web, People Are Using Online Service Sites, Blogs, Social Networking Sites Anywhere Anytime. It Is Necessary To Analyze And Understand These Online Generated Data For Proper Decision Making About A Process, Product And Service. The Object Of Sentiment Analysis Is An Item Or An Administration Whose Survey Has Been Made Open In The Internet. It Has Proved To Be Beneficial In Many Ways, Helping In Decision Making, In Brand Prediction And Its Reputation. In This Paper We Proposed An Enhanced Data Dictionary That Will Perform Data Pre-Processing Task More Efficiently And Effectively. We Justified This Enhancement Using A Case Study That Will Find The Brand Reputation Of Three Mobile Brands Namely Motorola, Samsung And Iphone.*

Keywords *-Sentiment Analysis, Net Brand Reputation, Revised Data Dictionary*

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I. INTRODUCTION

Twentieth Century's Offered A Very Powerful Tool To People To Share Their Emotions Online In The Form Of Social Media. Simply, It Is A Platform Where Numerous People Can Communicate With Each Other, Can Share Their Thoughts [1]. Though Initially, Its Use Was Just Communication, Later On, Significant Enhancements Are Seen, Such As Advertisement, Marketing, Video Entertainment, Business Development Etc. As The Development Of The Web And The Explosive Increasing Of People's Willingness To Express And Exchange Their Interests And Opinions On The Web, The Social Media Data Emerges, Including But Not Limited To: Facebook, Twitter [28]. The Social Media Data Is Considered As An Instance Of Big Data Due To The Following Reasons: (I) Volume-The Average Number Of Micro-Blogs To Report A News Event Is At Least 100,000; (Ii) Variety-Each Micro-Blog Is Composed By Different Materials (Such As, Words And Emotions); (Iii) Velocity-The Social Media Data Is Highly Dynamic. For Example, The New Coming Data In Each Day Is More Than 500TB In Facebook. (Iv)Value-The Rich Information Hidden In The Social Media Data Is A Perfect Testing Ground For The Researchers In The Big Data Area And Also A Powerful Tool For The Corporations And Governments To Make Specific Decisions Or Global Strategies. News Events, The Important Component Of The Social Media, Are News Stories Which Have Occurred In The Society Or On The Web And Are Reported Or Discussed By A Number Of Web Pages On The Web. After The Occurrence Of This Web Event, Many People Discuss It On The Web Through The Social Media. Browsing And Discussing The News Events Has Become The Routine Of Daily Life. Therefore, Rich Valuable Information Could Be Found Through The News Event Analysis For The Corporations And Governments. Among Lots Of News Event Analysis, One Of The Most Challenge Tasks Is The Sentiment Computing Of The News Events, Which Aims To Discover The Emotions Of The Texts (I.E., Micro-Blogs) From The Users. However, The Methods Proposed Almost Classify Texts Into Two Categories: Positive And Negative, Which Doesn't Conform The Characteristic That The Public Sentiment Is Complex. Nowadays, Some Researchers Tend To Compute The Text Multidimensional Emotions [1]. The Ability To Discover The Sentiment Of A News Event Can Be Used In A Variety Of Settings. For Example-Public Opinion Monitoring. There Are Lots Of Information About A News Event On The Web, So Accurately Locating The Information With Apparent Emotiveness (I.E., *Anger*) Could

Help The Decision Makers Understand The Public Concerns In A News Event, Product Feedback Monitoring. After Publishing A New Product, A Corporation Usually Wants To Know The Interests And Concerns Of Its Users About This Product. Accurately Locating The Information With Apparent Emotiveness (I.E., Surprise And Anger) Could Help This Corporation Evaluate Its Former Product Design And Make Decision On The Future Design [12]. As Use Of E-Commerce Website Is Increasing People Not Only Buy Products But Also Gives Their Feedbacks And Suggestions That Will Be Beneficial To Other Users Who To Want To Make A Decision As Well As Helpful To Organizations. As Companies/Organizations Are Always Interested In Few Questions That Are-

- What Individuals Are Thinking About Their Product?
- How Positive They Feel About Their Product And The Services?
- What They Like And Dislike They Have Mentioned In Their Comments About The Product?
- What Are The Actual Requirements Of The User?

The Entire Questions And The Answers Will Be Beneficial To The Organizations And They Will Also Know About The Competitors They Are Having As Well As To Users Who Wants To Know About The Particular Brand And Services Related To Them [1]. If Any Of The Individual Wants To Buy A Product The First Thing That Strikes Into The Mind Is That Whether We Should Check The Online Reviews That Are Posted On Different Websites By The Users Who Used That Product. From There The People Can Have Idea About The Product They Are Thinking To Buy Or They Can Have Any Other Alternative Instead Of That. So From There Arises A New Zone Of Area Called Sentiment Analysis And Opinion Mining (OM). OM Is Called The Task Of Classifying Texts Into Categories Depending On Whether They Express Positive Or Negative Sentiment, Or Whether They Enclose No Emotion At All [3]. Sentiment Analysis That Is Employed To Record The State Of Individuals Mind Towards The Specific Subject Or Any Other Connected Item. It Includes A Framework To Collect And Examine Opinions Regarding The Item Created In Journal Posts, Remarks, Audits Or Tweets [4]. Sentiment Mining Refers To The Use Of Linguistic Communication Handling, Content Investigation And Machine Linguistic To Acknowledge And Untangle Subjective Knowledge In Source.

II. RELATED WORK

In 2011, Daniel E. O'Leary Et. Al. In Their Paper Titled "Blog Mining Reviews And Extensions: "From Each According To His Opinions" Focus Some Of The Literature That Idea Is To Collect Sentiment, Opinion And Information From Websites, Blogs And Social Media. This Paper Additionally Expands The Past Writing In Various Bearings, Broadening The Utilization Of Learning From Labels On Web Journals, Finding The Requirement For Area Particular Terms To Catch A Wealthier Comprehension Of State Of Mind Of A Blog And Finding A Connection Between Data In Message Sheets And Sites. The Connection Between Blog Prattle And Deals, And Web Journals And Open Picture Are Likewise Inspected [16]

In 2015, Aliaksei Severyn Et. Al. In Their Paper Titled "Multi-Lingual Sentiment Mining On Youtube" Presents The Aftereffects Of An Exploration Exertion Focusing On Assessment Mining On Youtube Comments. They Handled The Issue As Multi-Classes Coordinated Characterization Errand, Where The Goal Is To Recognize The Remark Sort And Extremity. An Eccentricity Of Our Approach Is That They Recognize Video And Item Related Opinions [18]. They Manufacture An Essential Auxiliary Introduction In View Of Shallow Syntactic Trees Enhanced With Additional Sensible Data And Exhibit That It Contributes Towards Conventional Techniques That Rely Upon Sack Of-Words Models.

In 2015,Gerald Petz Et. Al. In Their Paper Titled "Reprint Of : Computational Approaches For Mining User Opinion On The Web 2.0" Shows That The Text Preprocessing Method Are Compulsory For Opinion Mining On The Web 2.0 And That Method Are Easily Influences To Misconception And Bugs Collected In The Client Generated Content. They Analysis On Different Social Media Channel And Their Text.

In 2016, Lihong Dong Et. Al. In Their Paper Titled "An Improved Algorithm Of Chinese Comments Opinion Mining Based On Adverbs" Discussed A Better Algorithm Of Chinese Comments OM That Is Based On Adverbs. By Using This Method They Increase The Negotiation Words Prediction Is Much Better Than The Previous Methods. The Experiment Results Proves To Be That The Comprehensive Measures Of The Proposed Method Is Superior To The Existing Method. By Using This Algorithm The Precision Rate Or Recall Rate Is Increased.

In 2015, Le Zheng Et. Al. In Their Paper Titled "Raw Wind Data Preprocessing: A Data-Mining Approach" Proposed On Crude Wind Information Properties, And The Gathered Information Are Isolated Into Six Zones In View Of Their Quality Sizes From A Factual Point [19]. The Following Stage Per-Frame Is The Separation Weighted, An Essential Thought For The Level Of Same Viewpoint Between The Individual Questions In The Wind Database And The Nearby Anomaly Figure (LOF) Calculation, Is Converge To

Compute The Exception Element Of Every Individual Protest, And This Anomaly Factor Is Then Used To Give What Class Or Gathering A Protest Has A Place With. At Long Last, The Technique Was Checked Promising On The Information Assembled From A Huge Twist Cultivate In Northwest China.

In 2016, Ajay Deshwal Et. Al. In Their Paper Titled "Twitter Sentiment Analysis Using Various Classification Algorithms" Proposed A Strategy Where They Consolidated Many Feature Extraction Strategies Like Emoticons, Exclamation And Question Mark Image, Word Gazetteer, Unigrams To Plan More Exact Sentiment Grouping Framework [7]. It Likewise Did An Exact Examination Of Six Supervised Grouping Calculations.

In 2016, Ratab Gull Et. Al. In Their Paper Titled "Preprocessing Of Twitter's Data For OM In Political Context" Proposed A Technique To Smooth The Assignment Of Opinion Mining As Taking Help From The Assistance Of Semantic And Sentiment Classifiers That Will Decide Negative, Positive And Unbiased Feelings Form The Political Gatherings Of Pakistan. A Strategy Is Given Which Pre-Forms The Crude Information Of Twitter And Examination Of Two Grouping Strategies To Characterize This Information. That Will Seek To Catch A Preview Of Current Political Situation To Advance The Soul Of Responsibility, Self-Investigation And Change In Among Pakistani Government Officials. In Addition, With This We Intend To Give Overall Public A Vital Solidified Voice In The Domain Of Legislative Issues [17].

In 2016, Suvarn Sharma Et. Al. In Their Paper Titled "Data Preprocessing Algorithm For Web Structure Mining" Proposed A Preprocessing Principle For Web Structure Mining. As Web Mining Has Different Stages That Are Gathering The Data, Then Cleaning The Raw Data Into The Meaningful Format, Then Finding The Meaningful Information And Last The Knowledge Analysis. This Paper Focused On 2 Steps That Are Data Preprocessing And Data Collection. The Rule Firstly Extract All Links From The Page Associated With Target URL And Then Build The Knowledge System. Finally, Achieved The Information System That Reduces The Duplicate Data And Only Provides The Original Structure Of Hyper-Links, The Information System Is Vastly Used To The Web Structure Analysis And To Provide High Results And The Performance [20].

In 2016, P. Sukumar Et. Al. In Their Paper Titled "Review On Modern Data Preprocessing Techniques In Web Usage Mining (WUM)" Focused On Data Preprocessing That Is Used To Tell The Success Of Its Technology Its Algorithms, Its Weakness And Issues. Many Of The Preprocessing Methods And Set Of Rules Are Put And Analyzed By Appliance Using Various Programming Languages. Data Preprocessing Algorithms Are Applied To Cleanse The Raw Data And Then Dividing The Data Into The Separate Zones So That The Better Results Can Be Achieved By Cleansing The Raw Data [21].

In 2016, Miss. Trupti A. Aneyrao Et. Al. In Their Paper Titled "Analysis For Data Preprocessing To Prevent Direct Discrimination In Data Mining" [22] Proposed The Method That Will Provide The Discrimination More Effectively As With The Help Of Combining Both The Methods Of Direct Rule Protection And Remove The Discrimination. As Discrimination Prevention Is A Critical Problem In Data Mining. It Is Provided That Methods That Are Based On Pre-Processing Are More Easy To Use Than The Other Two Methods That Are Used In-Processing And Post Processing Till; Preprocessing Method Involves The Modification Of Data And To Improve The Results.

In 2016, Santosh Kumar K L Et. Al. In Proposed "Opinion Mining And Sentiment Analysis On Online Customer Review" Focused On Web Mining Analysis From The Different Websites Like Amazon, Which Allows Users' To Write Anything About Their Services And To Give Any Of The Feedback Related To The Product. It Fundamentally Obtain The Results From The Website. They Make Usage Of 3 Algorithm Such As Naïve Bayes Classifier, Logistic Regression And Sentiwordnet Algorithm To Categorize The Results Into The Positive And Negative Review. And Finally They Used Quality Metric Parameters To Judge The Achievement Of Each And Every Algorithm [26].

In 2016, Mustofa Kamal Et. Al. In Their Paper Titled "Temporal Sentiment Analysis For Opinion Mining Of ASEAN Free Trade Area On Social Media" Build A New Method To Provide Opinions And Sentiment About AFTA (ASEAN Free Trade Area) By Sentiment Analysis And Opinion Mining That Are Based On The Timely Sentiment Analysis. This Method Will Extract And Provide Text Data Fundamentally To Know About The Sentiment Information Which Is Collected From The Opinion Sentences. The Results Proves The Success Of The Basic Method For Obtaining The Sentiment Facts From Individual Opinions And Some Users Or Students Who All Are Anxious In AFTA Have Provided The Services To Solve That Particular Problem [25].

In 2017, Sérgio Moro Et. Al. In Their Paper Titled "Stripping Customers Feedback On Hotels Through Data Mining: The Case Of Las Vegas Trip" Presents An Data Mining Approach For Demonstrating Trip Advisor Score Utilizing 504 Surveys Distributed In 2015 For The 21 Lodgings Situated In The Strip, Las

Vegas. Nineteen Quantitative Components Portraying The Surveys, Inns And The Users' Were Arranged And Utilized For Sustaining A Support Vector Machine For Demonstrating The Score. At That Point A Sensitivity Investigation Was Connected Over The Model For Separating Valuable Learning Converted Into Components' Importance For The Score [13].

In 2017, Mauro Dragoni Et. Al. In Their Paper Titled "A Three-Phase Approach For Exploiting Opinion Mining In Computational Advertising**"** Used The Dataset Developed By Stanford Containing So Many Million Reviews. Each Review Gives A Particular Product Entity (For Ex, "Dell Lati- Tude E6530"). From The Given Data, They Disposed Of Audits Containing Unequivocal Notices And Examinations With Items That Contrast From The Survey Focus (Around 7 Percent Of The Dataset). They Did This To Stay Away From Erroneous Relationship Amongst Perspectives And Conclusion Word [23].

III. M ETHOLOGY FOR SENTIMENT ANALYSIS

1. Data Collection It Is The Systematic Way To Gather Information And Measuring Information From Different Sources To Get Exact And Great Accuracy Result About The Region Of Interest. The Reviews Are Gathered From The Chosen Information. Exact Information Gathering Is Basic To Keeping Up The Integrity Of Research, Business Decisions And Ensuring Quality Assurance. As User Views Are Very Important For Any Of The Product And The Services [27]. The Data Collected Is Of Three Popular Mobile Brands That Are (Samsung, Iphone, Motorola) From The Twitter .Streaming API Allows The Real Time Data To Extract From The Twitter. The Data Collected Is From Month Of October, 2017 To January, 2018 That Are Approximate 60000 Tweets And Those Tweets Are Stored Into The .Txt File.

2. Preprocessing It Can Be Defined As Any Kind Of Processing Performed On Raw Information To Use It For Another Procedure Methodology. It Changes Information Into An Arrangement That Will Be More Easy To Handle And Can Be Easily Handled By User [4]. The Gathered Information Is Pre-Processed Or Cleaned For Investigation To Get Fair Reviews. The Steps Of Pre-Processing Were Sequentially Applied To Get More Accurate Results.

3. Classification It Is A Data Mining Function That Assigns Objects Into Categories. The Preprocessed Data Is Passed Through The Classifier Which Classified The Results Into The Positive, Negative And The Neutral.

IV. PROPOSED SCHEME FOR PREPROCESSING AND ENHANCING DATA DICTIONARY

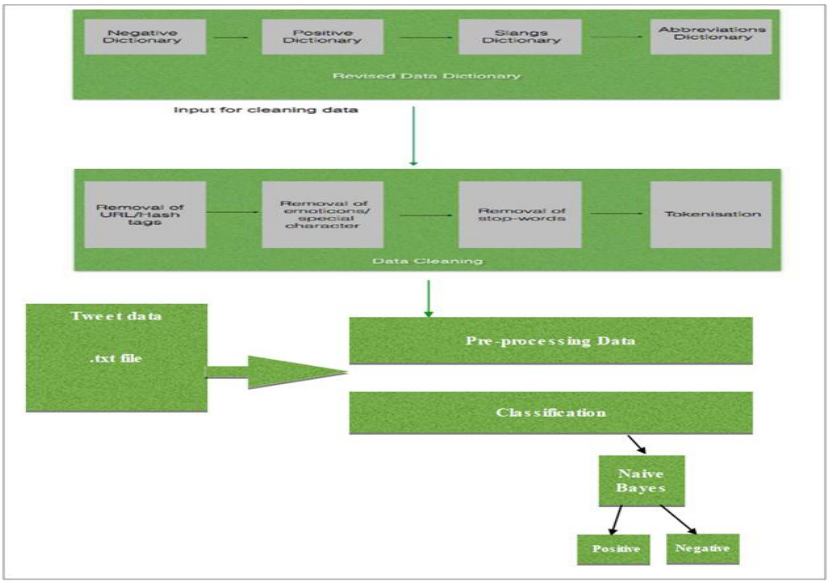

Fig 1. Proposed Scheme For Data Pre-Processing Using Enhanced Data Dictionary

The Proposed Solution Performs Data Cleaning, Preprocessing Of Data Using Enhanced Dictionary Followed By Classification. The Revised Data Dictionary Contains The Negative Dictionary, Positive Dictionary Slangs And The Abbreviation Dictionary.

1. Negative Dictionary It Is The Enhance Version Of The Existing Dictionary Which Are Available Online. It Contains Those Words That Individuals Use To Express Their Negative Feelings Towards Any Specific Product. For Ex-Bad, Disgusting, Hate, Abnormal, Abuse, Poor And Many More.

2. Positive Dictionary It Is The Enhance Version Of The Positive Dictionary Then The Existing Ones. It Contains More Than 5000 Positive Words That Are Used In Internet In Day To Day Life By The Individuals To Express Their Feelings. Ex-Admire, Best, Advantage, Love, Better, Bravo, Brilliant And So On.

Slangs Dictionary-Individuals Are Not Only Using The Negative And The Positive Sentiments To Express Their Feelings But They Are Also Using The Slangs And The Abbreviations To Express Their Views Towards Specific Products. So The Basis Focus Is On Slangs. As Mostly People Are Using Slangs And Abbreviations On Internet So It Becomes Necessarily To Pay Attention To Those Words. So We Created A Slangs And Abbreviations Dictionary To Capture All Those Word In The Data. Ex- Lol, OMFG, SOB, STFU, WTF, Screwed Up, Yaaaass, Cre8, B/4, IMO, Piece Of Cake, Af, Toe And Many More.

With The Help Of All These Dictionaries We Performed Data Preprocessing On The No. Of Tweets Collected For The Three Mobile Brands Specifically Motorola, Iphone And Samsung. The Dictionary Will Be The Input For The Preprocessing. Data Dictionary Enhancement Can Help To Do Preprocessing Much More Efficiently And Effectively Providing More Accurate Results Then The Existing Ones. Then Finally The Preprocessed Data Is Passed To The Classifier To Know About The Sentiments I.E. The Brand Reputation Of The Mentioned Mobile Brands.

V. SYSTEM MODEL FLOW CHART

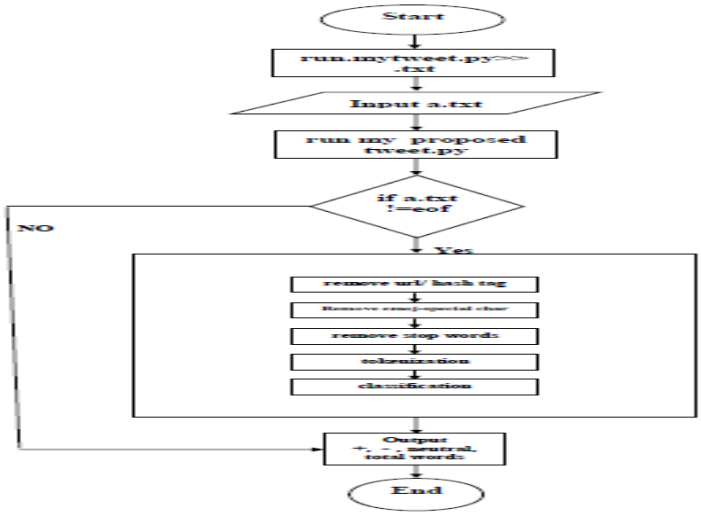

Fig 2. System Model Flowchart For Process Of Sentiment Analysis.

VI. RESULT AND DISCUSSIONS

The Data Is Passed Through The Classifier Which Gives The Appropriate Sentiments Of The Brands. From The Result We Would Get To Know About The Most Famous Brand Among All Of Them Which Was Mostly Liked By The Customers.

Using The Above Mentioned Scheme Based On Enhanced Data Dictionary We Calculated The Positive, Negative And Neutral Words From The Given Bag Of Words.

Table 1. Shows The Classification Results For The Brand Motorola Showing 288 Positive And 1196 Negative Values In A Total Of 50048 Words Where The Neutral Words Are 48564.

Motorola			
Positive	Negative	Neutral	Total Words
288	1196	48564	50048

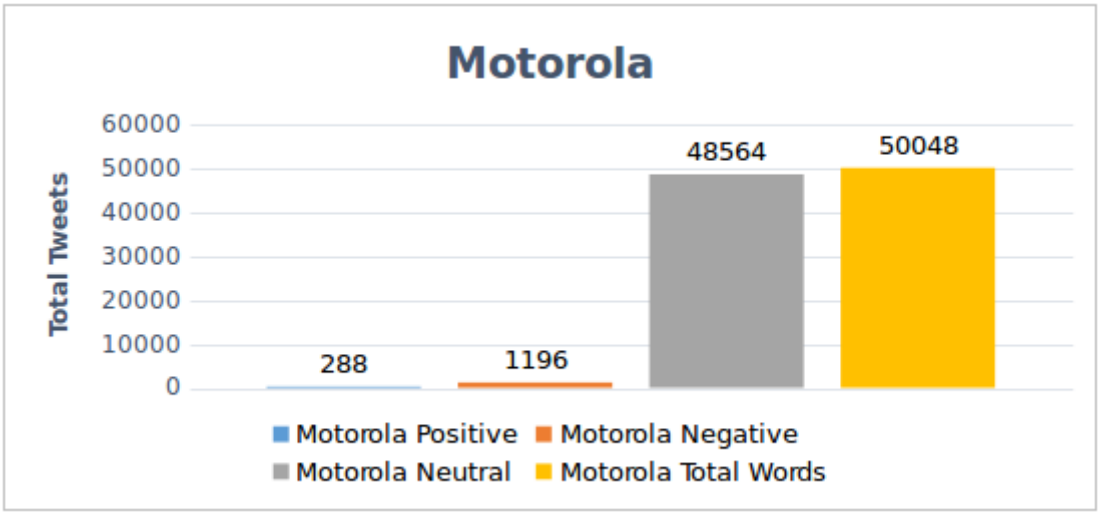

Fig 3. Showing Results For The Brand Motorola.

Table 2. Shows The Classification Results For The Brand Samsung Showing 265 Positive, 1194 Negative Words In A Total Of 46249 Words Where The Neutral Words Are 44790

Samsung			
Positive	Negative	Neutral	Total words
265	1194	44790	46249

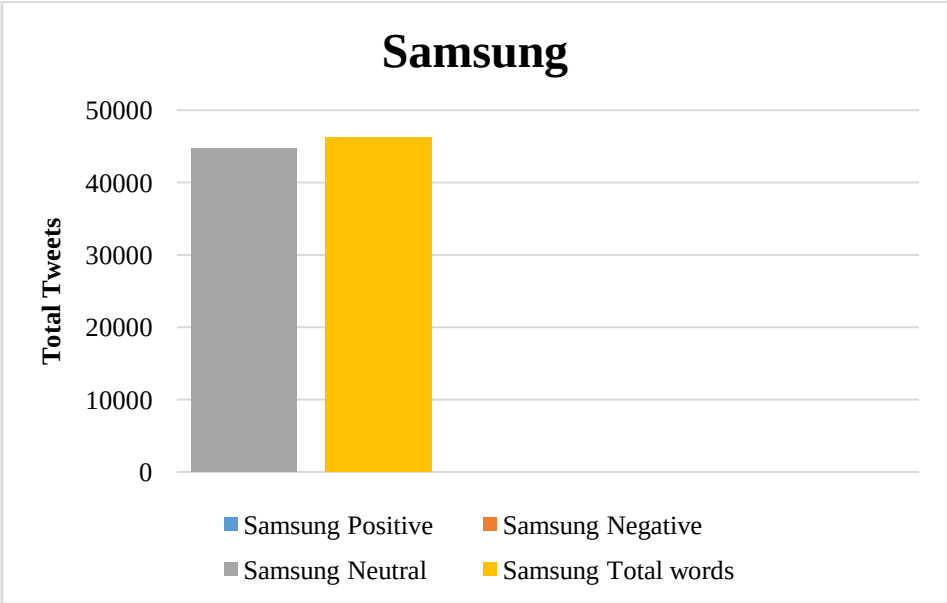

Fig 4. Showing Results For The Brand Samsung.

Table 3. Shows The Classification Results For The Brand Iphone Showing 881 Positive, 7080 Negative Words In A Total Of 506244 Words Where The Neutral Words Are 498283

Iphone			
Positive	Negative	Neutral	Total Words
881	7080	498283	506244

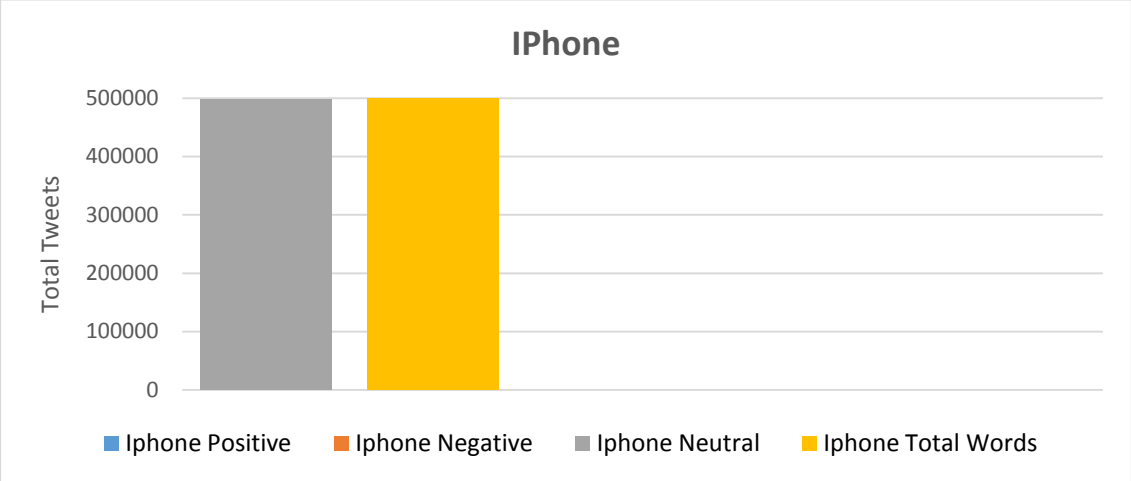

Fig 5. Showing Results For The Brand Iphone.

Table 4. Accuracy Of The System

Accuracy		
Motorola	Samsung	Iphone
88.6	89.1	93.2

1. Net Brand Reputation The Net Brand Reputation Is The Net Value Of The Brand Reputation Measured From Media. The Use Of NBR Is The Simplification On The Measurement Of The Consumer's Loyalty. Now We Are Going To Calculate The Net Brand Reputation By Using This Formula [11].

$$\text{NBR}=\frac{(Postivewords\ -negativewords\ )}{(postivewords\ +negativewords\ )}*100$$

Using The Formula For NBR We Calculated The Brand Reputation And Came To The Result That Iphone Is The Most Preferred Brand Out Of The Three.

Table 5.Showing The Net Brand Reputation For All Three Brands

Net Brand Reputation		
Motorola	Samsung	Iphone
61.1	63.7	77.8

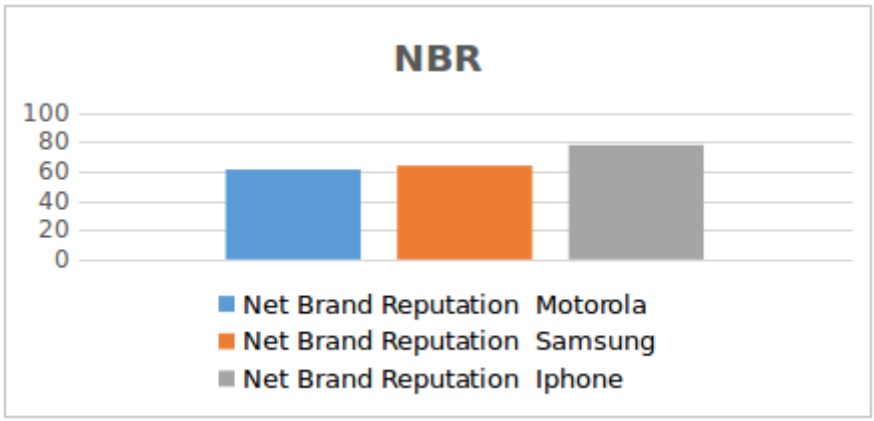

Fig 6. Showing Net Brand Reputation For All The Three Brands

From The Above Results It Is Found That The Enhanced Data Dictionary Performs Well As Compared To The Existing Dictionary Giving More Refined And Accurate Results. From The Above Study We Came To The Findings That Iphone Is The Most Preferred Mobile Brand As Compared To Samsung And Motorola As It Is Having More Accuracy And Net Brand Reputation Then All The Other 2 Brands.

VII. CONCLUSION

As Social Media Is Emerging Day By Day And Providing An Environment To The Individuals And The Organizations To Exchange Their Views, Opinions, Comments, Information With Each Other. According To The New Trend Most Of The Companies, Organizations Are Using Sentiment Analysis To Know About Their Product, Services And Feedbacks. Sentiment Analysis Become Very Important When It Comes To Decision Making. The Main Objective Is To Find Out The Sentiment Analysis Of The 3 Mobile Brands (Samsung, Motorola, And Iphone). The Results Gives That The Most Preferred Brand Among The Individuals Are The Iphone Having More Accuracy And The Net Brand Reputation Amongst The 2 Brands.

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