# Effect of Diff-in-Diff Analysis in Serendipity

### <sup>1</sup>Tanvi Mori, <sup>2</sup>Ashishkumar Patel

<sup>1</sup> P.G. student, <sup>2</sup>Assistant professor <sup>1</sup> Department of computer engineering, <sup>1</sup> LDRP-ITR, Gandhinagar, Gujarat, India

*Abstract*— In social network many people are interconnected together. Diff-in-Diff Analysis is useful to find Reputation of the person in social network. Reputation is measure with in time period (like one month, six month, Year).in the Diff-in-Diff Analysis reputation will measure using Friend's likes, comments, Followers', etc. The Person's Reputation goes down for particular Friend that Person Remove that friend and adds some new friend that is helpful to improve Reputation. To calculate Reputation first measure Engagement Rate then add some new friend and measure Engagement Rate once Again and after that perform Diff-in-Diff Analysis and compare both result and find out difference between them. And this difference is the result of the reputation of person in social network.

### Index Terms— Social Network, Engagement Rate, Serendipity, Facebook, Interaction

#### I. INTRODUCTION

Social networks are built from a group of people who share the same interests, backgrounds, and activities. There are many possible way to communicate with each other in social Network. They can socially share and upload files such as images, videos, and audios to their profiles. [1].

In Facebook users can create their own profile, add other users as "friends", post their status, upload their photographs, exchange messages, share videos and receive notifications when others peoples update their profiles. Additionally, users may create groups, join group, and categorize their friends into particular group such as Close Friends or School Friends. [1]

Social networks, as the largest social media platform, it play important role in marketing. Social networks provide the technological platform for the individuals to connect, produce and share content online. Such as, for brand owners, they can do advertising, product development, and market intelligence (1) advertising provide facilitates for marketing, (2) product development can be done to involving consumers in the design process, and (3) market intelligence can be taken using analyze the user generated content.[2]

Using Facebook any companies can set up and moderate a Facebook brand page, and monitor continuously the consumers' activities. And the result of this change in the field of marketing is known as social media marketing (SMM). Social media marketing is a WOM marketing, and also known as viral marketing. it is done influencing of consumer-to-consumer communication.[2]

Brand communities are helpful to increasing sales and useful to improve the relationship between the consumers and the brand. Brand communities engaging their members in a form of WOM communication and provide facilitate to do interactions and exchange opinions about the particular product or brand among consumers. Definitions of engagement within brand communities refers to it as "consumer's motivation to interact and cooperate with community members" There are some factors that influence the level of online customer engagement on Social media marketing. There are two basic elements useful to company's engagement plan the first is which content should be posted to Reach higher level of online engagement and second is when the content should be posted.[2]

The content shared on brand pages is called posts and appears on the central part of the page, this central part of page is known as the timeline or wall. Each page might have one or more administrators. This administrator is responsible for creation and deletion of content, so the administrator is also called the page moderator. A brand page can have many numbers of members, and these members are known as fans or users. In a Facebook brand page, fans can engage with a company by posting content on the wall, indicating interest in an existing post by pressing the "like" button, i.e. called liking, commenting on the existing post that is shared by the brand pages moderator, and sharing the post on their own profile wall. Each of these actions generates a new story; these stories appear on the wall of each of the fan's Facebook friends. As such, this action is called Word-of-mouth communication. [2]

To find Engagement of brand page evaluate the effect of the content characteristics, such as content type, media type, day of posting and time of posting, over the level of online engagement on a Facebook brand page. There are many possible ways to

measure the engagement Rate that are (1) the number of likes over the content created by the page moderator, (2) number of comments, (3) number of shares and (4) interaction duration.[2]

Measuring the Engagement: The Facebook official measure for customer engagement over a content created by the company on a Facebook brand page is the feedback rate .Feedback Rate is defined as a ratio between the sum of comments and likes over the post, and the number of post impressions:

Feedback rate = Likes + Comments/Impressions

Here an impression refers to the number of times the post was displayed on the page wall, shown on profile walls of fans. This measure is not accurate since it does not guarantee that the post was seen or read by the fans. To overcome this problem, propose separate measures that correspond to each of the possible activities. Using the likes ratio (LR), Comments ratio (CR), and shares ratio (SR) as more accurate measures. [2]Thus, the calculation of the depended variables was performed using the following formulas:

 $LR = N_L/N_F$ 

 $CR = N_C / N_F$ 

 $SR = N_S / N_F$ 

Where  $N_L$ ,  $N_C$ , and  $N_S$  are the number of likes, comments, and shares, respectively, and NF is the total number of fans on the day of posting.

To calculate the interaction duration we used the following formula:

ID = TLI - TC

Where TC is the time of post creation and TLI is the time of last interaction over the post. The obtained values for interaction duration were rounded over minutes scale. [2]

### II. EDGE RANK

"Edge Rank is used in Facebook, Edge Rank algorithm that is useful to decide which stories show in to each user's newsfeed. The first things that face book user sees when they log into Facebook is called users newsfeed." The Edge Rank is algorithm that Decide which types of Story should be appear higher every persons news feeds. [4]

Edge Rank is unique to each user and it is calculated using this three parameters

- Affinity Score
- Edge Weight
- Time Decay



Figure: 1 Edge Rank Algorithm [5]

Affinity Score : Facebook first calculates affinity score, Affinity score should be calculate using users actions that user frequently take like user frequently click some friends post, like some friends post, Give comments in some friends post, tagging some friends frequently, sharing posts of friends. [4]

Edge Weight: Every action that a user takes every times is creates an edge, There are two types of weights first is the post weight and another is weight of an interaction. Example of post weight is photos and videos contain higher weights compare to links. Another factor of weight is interaction; users friends are give likes, comments, and share users post. Shares and comments have higher weight compare to simple like or click the post. [4]

Time Decay: Edge Rank is a running score--not a one-time measuring score. The old Edge contains lower weight compare to new edge. A fresh post is more time shown in face book users newsfeed compare to an old post. [4]

### **III. ENGAGEMENT MATRIX**

Engagement rate is the percentage of people who saw a post and Give liked, comments and share a post. Engagement on Facebook accounts for the public ways social audience can interact with brand page or make them show up in their Newsfeeds. [6]

Engagement is Measure using following parameter during a fixed time period:

- Likes: When a face book users likes a brand post on a page.
- ➢ Comments: When a user gives comments in brand post.
- Shares: When a user shares one of brand posts with his or her friends.

Engagement rate is calculated for one post or for a page as the number of interactions to a post (likes and comments and shares) is divided by the total number of fans. [7]



## (Total Engagement / Fans) x 100 = Engagement Rate

Figure 2: Engagement Rate Formula [8]

### **IV. DIFF-IN-DIFF ANALYSIS**

Social Network like Facebook User has many numbers of friends in their friend list. But user is not interested to watch every friends post or status updates in to their newsfeed. And other side all friends are not interested to watch the all post of user. At that time Diff-in-Diff analysis is useful to find number of friends who are actually connected to the users post. Diff-in-Diff stands difference in difference analysis. Difference in Differences requires data measured at two or more different time periods.

Whenever users update their post into face book numbers of friends of user are giving like, comment and share the users post. But all friend are not seen the users post into their newsfeed because of Edge Rank Algorithm. Edge Rank is used in Face book, so it is called Facebook algorithm that is use to decides which post shown in each user's newsfeed. The first thing face book user sees when they log into Face book is called newsfeed. [2]

To find reputation of person first calculate number of post that user share in to the face book with in fixed time (like month or six month).reputation of user is calculate using their friends like plus comment plus share divide by total no of friend. After calculating reputation add some new friend and then calculate reputation once again. And after that perform Diff-in-Diff analysis and calculate difference between them. It's called Engagement Rate of user's post.

Engagement Rate of brand post is already Exist. Engagement on Face book accounts for the public ways social audience can interact with any brand posts in page and show up that post in their Newsfeeds and those of their Face book friends. People Engaged in brand page is calculate using The unique number of people who liked, commented, shared, or clicked on Brand post [6].

### **V.** CONCLUSION

This paper describes how we can use Diff-in-Diff Analysis in Facebook and find reputation of Facebook user using their post detail, post Detail contains Number of user's friends who give likes, comments, and share the user's posts. Engagement Rate of page post is Exist. And there are many ways to calculate Engagement Rate of brand pages posts. Using brand pages fans likes, comments and shares of post calculate Engagement rate of brands. But there is not any method to calculate Engagement Rate of users post.

### VI. ACKNOWLEDGMENT

I take great pleasure in thanking Prof. Ashish Patel for giving me the chance to work under his prestigious guidance. Special thanks to institute LDRPP-ITR, Gandhinagar, for giving me such a nice opportunity to work in the great environment. I heartily appreciate my family members for their motivation and support.

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