

Building a Contact Network Influencer Dataset – An Intuitive Study of Cyber and Social Psychology for Group Purchase Behaviour

PayalGohel, Rajiv Chavada

PhD Researcher, Saurashtra University, Rajkot-360001

Researcher, Pune - 411057

Corresponding Author; PayalGohel

ABSTRACT

Penetration of mobile users and use of social media by billions have revolutionised the way people do things. These technologies have the capacity to impact our lives and has opened a new opportunities and possibilities that were not possible for the research. Social networks are fundamentally social tools in which people are constantly empowering and growing their social network. There are ways to measure the influence of media where it can depict growth using the degree of point definition, control and independence. The centrality of the users indicates which members are the most useful or well-connected and therefore they carry the most influential information resources. This research targets the emerging area of group purchasing, social marketing and target advertising. Social marketing will enhance the market understanding by learning what people want and need rather than trying to persuade them to buy what they happen to be offering. This aim of this research is to investigate how the social marketing paradigm works, involve students in the research experiments to educate and train them regarding latest technologies involved, and identifying the approach to do it right. The proposed research successfully implemented android app dubbed as SONET to conduct research experiments and interacted with targeted users. This app focuses on i) user's privacy related issues, ii) periodical data capturing and iii) user's localization. Couple of research methods are used in research experiments to conduct qualitative and quantitative data including i) SONET app captures consistent data over time for 4 weeks and helps to build the dynamic datasets of social contact network, ii) Conducted online Survey to gather quantitative data from SNS users.

Keywords: Social Network, Group behaviour, Mobile computing, Social marketing, Social network service, Mobile application

Date of Submission: 04-11-2019

Date Of Acceptance: 25-11-2019

I. INTRODUCTION

This research targets the emerging area of group purchasing, social awareness and target advertising. It focuses on social marketing¹ which is the next big paradigm that is affecting and will affect our everyday lives. Social marketing will enhance the market understanding by learning what people want and need rather than trying to persuade them to buy what they happen to be offering. Other researchers have cited new marketing models with rise of social networking such as Tuangou refers to the phenomenon that a group of web users are organised using the internet and physically approach the retailers together to negotiate for a discount for a particular product or service by using their collective bargaining power [3]. Another

social network service² (SNS) "Kakao talk", a smartphone application in South Korea which recommends friends to the user by their contact information in their social network [4], even the UK government has issued guidelines for involvement[5]. It is pertinent to investigate the SNS structure characteristics and how these characteristics can affect the consumers' network involvement which may lead to increase purchase intention to the recommended deals by other friends through SNS. So, Integration of SNS with marketing can increase the consumers' purchase intention and have positive effects to the online sellers.

This aim of this research is to investigate how the social marketing paradigm works, involve

¹Social marketing is an integrated approach where consumer will receive offers, product promotions based on their social interaction with other people.

²SNS (social network service) is a web-based individual centered service, platform, or site that focuses on building and reflecting of social networks or social relations among people.

BU students in the research experiments to educate and train them regarding latest technologies involved, and identifying the approach to do it right. This research also gives high priority and investigates how to do all this while maintaining some user privacy. This is a very cutting edge and relevant research which will employ smartphone application to conduct research experiments and interacts with the targeted participants. The android app will be distributed to collect qualitative data and send offers to participants during experiments. In order to achieve the research aim, important research objectives have been defined as following:

- i) To develop smartphone application in order to build contact network datasets and investigates social marketing approach to infer social network structure, users centrality etc.
- ii) To design research experiments to collect data from participants using developed mobile application and also use popular social networking application (WhatsApp).
- iii) To gather quantitative data through questionnaires with research participants, in order to analyse their using patterns and concern with social networking sites and enhance their understanding about social marketing.

In nutshell, the proposed research will produce social contact network³ data sets (others in existence the Cambridge, infoComm, MIT and nokia [2]) via experiment which will contributes towards the originality of the research.

1. Design and Development of smartphone application – SONET

The important objective for this research is to mimic a real-world interactive experiment using smartphone application to develop participant's data-sets while maintaining their privacy. This research developed **SO** Contact-NETwork (SONET), an ANDROID based application to experiment the proposed approach. This section gives overview of the SONET app and explains three important aspects of it including i) user's privacy, ii) periodical data capturing and iii) Bluetooth localization and use of GCM (Google cloud messaging) to issue voucher etc;

2.1 User's privacy using RSA encryption

In this research, the android app used RSA algorithm to encrypts the user's information i.e. Student id to manage their privacy and keep them

³A social contact network is the graph of relationships and active interactions within a group of individuals and plays a fundamental role as a medium for the spread of information, ideas, and influence among its members [1].

anonymous throughout the process. This information can only be decrypted by person with private key.

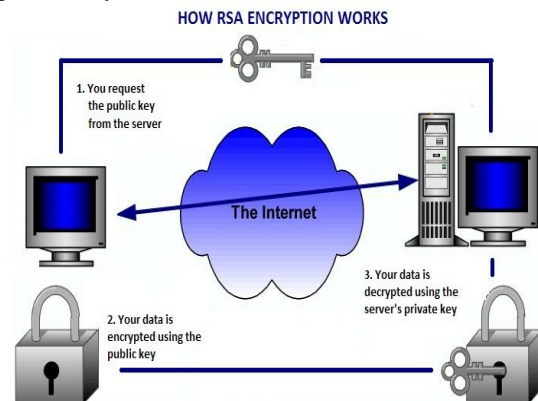


Figure 1 : RSA algorithm

With such kind of approach, there will be very less intrusion to user's privacy compare to current approach used by google, facebook etc. The figure 1 explains how RSA encryption works. This research employs the asymmetric cryptographic RSA (Ron Rivest, Adi Shamir and LeonardAdleman) algorithm to encrypt and decrypt user data. Asymmetric means that there are two different keysi) public key to encrypt the data and ii) private key to decrypt the data.

Public key	Private key
Encryption	Decryption
Ho+NlaYPysGleEMnsiF8CzimdduwCdglNv mrtxtgyfDo+MN9XrBdluoiigxS6Ug/enD7e mXnxywVlUnxZAmZCycnp4L5K26rG/EscX 99FDIIBAlmaQHHzYP/+0Kv0BMBpl6GRD UIPcxiOvmQgrU8RZaSXKHuMq+dr6UHv NZN4QINMY9sHjD8q6s+DG/E2vukplHHnz WloZbmiWUZ3YbFEQFPzTz6VIN8E6leM9C F40VVA6RkTB2IjaWvMHHEkEaEUTNQsr VqJRPraqKWVbsVgJV13ndYbCEfp40T4df KlythZQJ80rNdr664keZKWthp8LcGmVd	i1234567

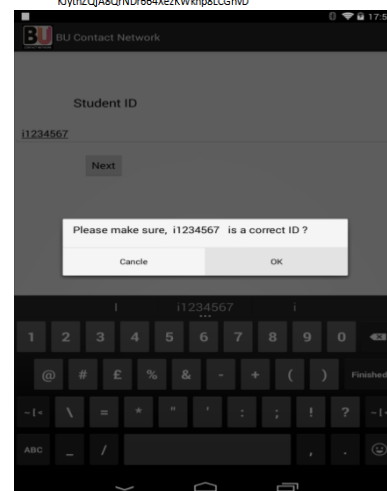


Figure 2 : Encrypt user info.

The figure 2 demonstrates, once user enters their details, it will be encrypted in a form which will be impossible to reverse it. It uses 128 bits RSA algorithm, which is a very reliable cryptography algorithm to conduct experiment without compromising user's privacy. This

encrypted code can only be decrypted by person with private key.

2.2 Smartphone data collection process

This research study focuses on collecting and developing datasets by keeping traces of all access WiFipoints passed by the participants and other network related information. Data is stored on a secure server. The metadata gives some insight on subset of information which will be stored in data server. i) User and device ID - To create a unique id using random number generator and Bluetooth device id which is unique to each device. ii) Network ID connected to WiFi Network., iii) Application scan all the available WiFi networks. iv) WiFi access point. v) Same WiFi network can have many router access points with unique id. Vi) other connection Info, vii) Connection time

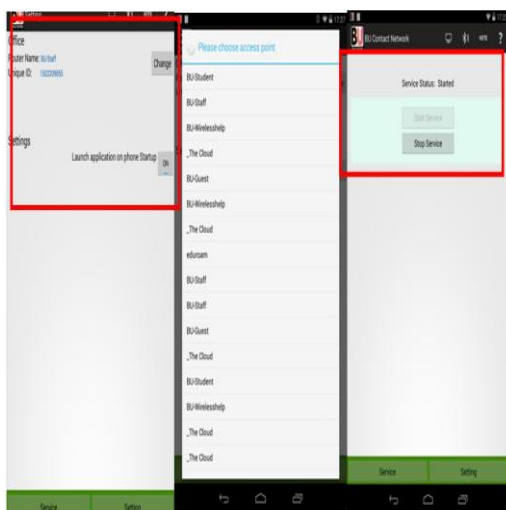


Figure 3 : Periodic data collection service

The figure 3 demonstrates the flow of the data collection functionality which will scan all the Wi-Fi points and its network related information every minute throughout the day till the end of an experiment. Each day, it logs all the traces of Wi-Fi access points and compresses the file and sends back to SOAP data server. This information will be used to infer the social network structure and understand its dynamic nature and user's centrality. In brief, the data capturing process presents few pertinent points including i) assign a unique id to users in order to keep them anonymous ii) start/stop the data recording service from app UI iii) scan the available network (User will see many network with same name but different access points) and iv) send regular periodic updates to secure data server.

2.3 User localisation

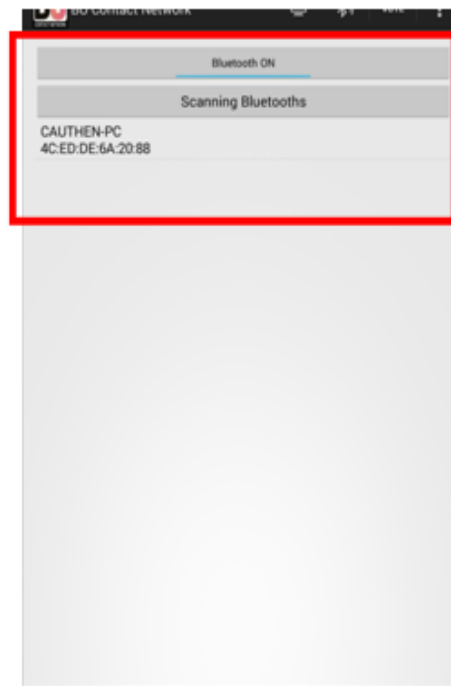


Figure 4 : Users localisation

Further to previous functionalities, the developed SONET app also logs whenever more than one participant is in the same location. It does not log the location itself. It maps the user's close proximity with other users and automatically reports back to server based on Bluetooth communication. The research requires this information to infer the social network of the group as a whole.

In this research, authors have used two ways to infer the user localisation by mapping the Wi-Fi access points and Bluetooth communication.

1. Establish communication between two users by analysing collected data (comparing their WIFI access point id and time).
2. Scan Bluetooth adapters in close proximity connection to match with wanted Ids and report back to secure server.

In nutshell, the SONET app assisted to capture the consistent data over time for 4 weeks and helps to build the dynamic datasets of social contact network (as explained in above sections) without compromising user's privacy and data security.

3. Data collection through survey

Data collection was collected through survey from 15 research participants by online survey system. In order to get more appropriate data, we just focus on the people who had the SNS using experiences. Figure 5 presents the simple steps to conduct the survey.

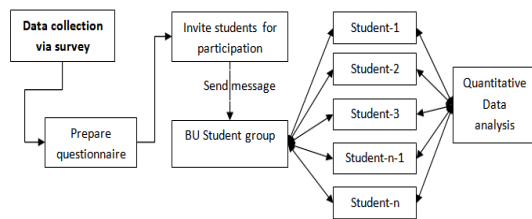


Figure 5: Data collection using survey

1. Prepare a questionnaire guide.
 - 1.1 Design the questionnaire.
 - 1.2 Run a pilot.
 - 1.3 Revise the Questionnaire.
2. Send email to students and also announce a message to WhatsApp group for participation in the questionnaire/survey.
3. On survey completion, analyse the collected data.

Among the respondents 75% were postgraduate and 25% were undergraduate students. Also there were 60% male and 40% female respondents who ranged in between 24-60 years age group. There are 90% respondents who are using facebook and 100% who are using linkdln which are the most popular SNS and almost 70% of them had more than 100 contacts in their social network. Mobile SNS is very popular these days, there are 60% people are using WhatsApp which is a very popular mobile messenger with University students.

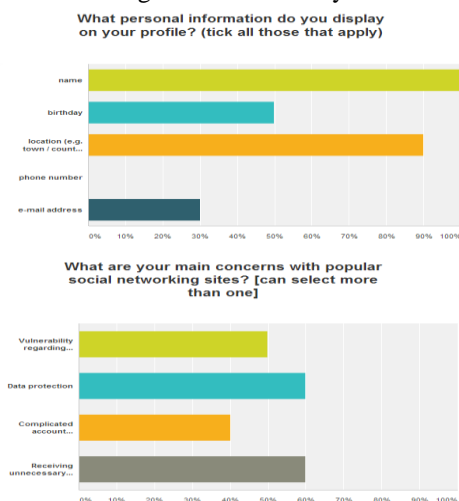
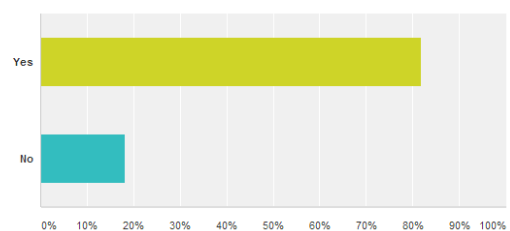


Figure 6 : User's information sharing concerns on SNS i) what kind of information users display on their profile ii) user's main concerns regarding such information.

Figure 6 illustrates all the participants' shares their name, 90% their location, 50% shares their birthdays and about 30% shares their email id on social networking site. However, nobody suggested sharing their phone number on SNS as it

considers being highly intrusive. Sharing personal information on SNS makes users very vulnerable to cyber-attack. In another charts presents, 60% participants felt exposed to cyber-attack and 50% of them thinks their privacy is not being protected. About 60% participants also felt that they are many advertising intrusions and 40% complained about very complicated preference settings regarding sharing information on social network. Such information assisted to identify some concerns and design more secured, anonymous and less intrusive application.

Would you prefer to decide what kind of adverts you receive from your social networking applications?



Would you prefer to receive discounts based on your active social interaction with friends? (for example if you and a friend both go to the cinema you both receive offers)

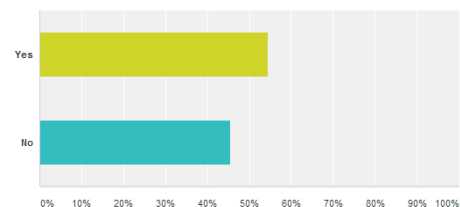


Figure 7: User's preferences regarding social marketing

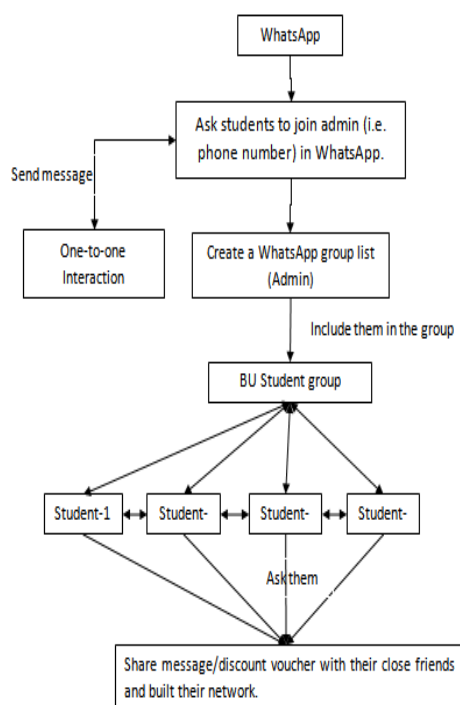
In order to understand the social marketing concept where users would have more control regarding what kind of advert, when and how they prefer it etc. Figure 7 reveals almost 80% respondents preferred to decide what kind of product /offers they would like to receive. Another chart illustrates almost 55% participants preferred to receive group discount based on their active social interaction with their friends, family or work colleague.

Design an experiment using SNS

Social networks are fundamentally social tools in which people are constantly monitoring and growing their social network, most social network media depict growth. Smartphone based SNS (WhatsApp) is proposed to infer the student social network structure based on their communication and then discounts was offered. This experiment involves sending a unique code via WhatsApp to participants offering them a

discount based on their active participation for a particular period of time. They may pass on information about this discount to a friend or colleague. Their friend may then message the WhatsApp service and request a discount for the same period. No other user intervention is required for this experiment. The more actively users participates in this experiment the more likely they will seed offers. Figure 8 shows the simple procedure to take part in this research experiment as following:

1. Join the “BU Contact network” group by sending message to admin through WhatsApp application.
2. Then, admin will add participant into the “BU-Contact Network” group and send a unique code.
3. Participant can share this unique code with their friends. Then, participant will send this code to admin for asking an offer.
4. Admin will send an offer code to whoever asks for it.
5. Participant will go to i.e. Costa coffee and show them the code to claim their discounts.



Once data was collected, an understanding of social networks needs also to include accounts of centrality and of one user’s relationship to other users in a network. [4] explored how “graph centralization” was based on differences in point centralities. The author also explained three competing theories regarding the definition of centrality based on degree of a point, control and independence.

- **Degree of a point:** It refers to the number of nodes connected to a given node. For example: The bigger social network, participants have, the more important they are.
- **Degree of Control:** It refers to the extent to which nodes depend on one specific node to communicate with other nodes. For example: if hundreds of friends are connected to each other only when i.e. UID100 serve as the bridge connecting them, then UID100 centrality is high and it means UID100 controls the communication flows.
- **Independence:** It means that a node is closely related to all the nodes considered. Hence, it is minimally dependent on any single node and is not subject to control. It means participant can reach the maximum number of people through the shortest number of links, without being dependent on a particular few nodes. Figure 6 presents user’s centrality graph based on collected data where

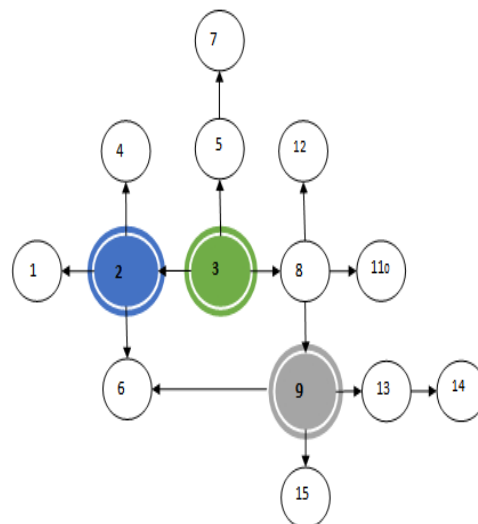


Figure 5 : Social network centrality graph

- **Degree of point:** UID-2 and UID-9 have the most nodes connected to them.
- **Degree of Control:** UID-3 serves as the bridge between the most nodes and controls the flow of information.
- **Independence:** UID-9 is most closely connected to the other nodes by multiple nodes (UID-6 and UID-8).

II. CONCLUSION

Social networks are fundamentally social tools in which people are constantly monitoring and growing their social network, most social network media depict growth using the degree of point definition, control and independence. This research targets the emerging area of group purchasing, social marketing and target advertising. Social marketing will enhance the market

understanding by learning what people want and need rather than trying to persuade them to buy what they happen to be offering. This aim of this research is to investigate how the social marketing paradigm works, involve BU students in the research experiments to educate and train them regarding latest technologies involved, and identifying the approach to do it right. The proposed research successfully implemented android app dubbed as SONET to conduct research experiments and interacted with targeted. This app focuses on i) user's privacy related issues, ii) periodical data capturing and iii) user's localization. Various research methods are used in research experiments to conduct qualitative and quantitative data including i) SONET app captures consistent data over time for 4 weeks and helps to build the dynamic datasets of social contact network and ii) Conducted online Survey to gather quantitative data from SNS users, and iii) ii) Mobile based SNS (WhatsApp) to infer the student social network structure based on their active participating for 2 weeks. One of the critical challenges encountered during research was difficulty in finding suitable participants (user's with android OS mobile, interacting in a cluster etc) for this research. The research was conducted with limited number of participants, it collected consistent and continuous data periodically using aforementioned methods to investigate the social marketing approach and infer dynamic social contact network. However, the authors recommend collecting data from users in order to develop social network datasets and analyse it rigorously to infer dynamic contact network for future research.

REFERENCES

- [1]. David Kempe, Jon Kleinberg and Eva Tardos – “Maximizing the Spread of Influence through a Social Network”, Proceedings of the ninth ACM SIGKDD international conference on Knowledge discovery and data mining, August 24-27, 2003, Washington, D.C.
- [2]. Fay, Yoneki and Kunegis – “Centrality and mode detection in dynamic contact graphs: a joint diagonalisation approach”, ASONAM 2013.
- [3]. Freeman, L. C. (1979.) – “Centrality in social networks conceptual clarification”, *Social Networks*, 1 pp. 215-239.
- [4]. Huang, Minyi and Yen, Benjamin – “Retailer acceptance of consumer led group buying from a stakeholder influence strategy perspective”, PACIS 2010.
- [5]. Shin, Park, Ju – “The effect of the online social network structure on Korean social promotion sites”, APDSI, 2011, Taipei
- [6]. UK Department for business, innovation & skills, guide for community buying groups, <https://www.gov.uk/government/publications/guide-for-community-buying-groups>.

PayalGohel and Rajiv Chavada (2019), "Building a Contact Network Influencer Dataset– Anintuitive Study of Cyber and Social Psychology Forgroup PurchaseBehaviour" International Journal of Engineering Research and Applications (IJERA), vol. 9, no. 11, 2019, pp 74-79