Evolved Social Media Trend: Minefield for Recruiting, Screening and Hiring Employees

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***Abstract*— Social networking Sites (SNS) now a day are not only being used for connecting the people. There are lot many trends associated with them. One of the recent trends is the use of SNS by the employers to find the most suitable candidates for the jobs in their organization. No organization is ready to invest in an employee who is having any kind of fake information associated with him in his resume. SNS is a new way to find out the behaviour of a candidate which may cover many of his qualities and weaknesses like whether the candidate is social enough to work in a team etc. These qualities contribute to the Emotional and Intelligence Level of the candidate which in turn helps in finding the suitable ones. In this paper we have proposed a method of converting these qualities into mathematical form. These qualities help in calculating the two main parameters i.e. Emotional Quotient and Intelligence Quotient which directly link to the requirements of an organization in selecting candidates. Data set is being analysed using Weka and Hadoop to obtain the suitable and most suitable candidates for the organization respectively.**

Index Terms*— Social Networking Sites (SNS); Weka; Hadoop; Emotional Quotient; Intelligence Quotient.

I. INTRODUCTION

Social network sites are the web-based services which basically allow individuals to create a public or semi public profile, having a list of persons with whom they can share a connection, view and traverse their list of connections and that of others made within that bounded system. The nature and nomenclature of these connections may vary from site to site. A wide collection of technical features have been implemented in these Social network sites but the thing which makes them different or what can be called as the backbone of SNS is that they enable visible profiles that display an articulated list of Friends who are also users of the system. This public display of connections is one of the most important component of SNSs. Beyond profiles, friends; SNSs vary greatly in their features and user base. Some of the SNSs have photo sharing and video sharing capabilities and other differ from them by having built-in blogging and instant messaging [14].In nut shell Social networking sites allow users to share ideas, pictures, posts, activities, events and interests with people in their network. Online community services are sometimes considered as a social network service, though in a broader sense, social network service usually means an individual-centered service whereas online community services are group-centered.

Today, networking within online social isn't just for swapping pictures and music or discussing the trivial of a TV show or a sporting event. Social media is increasingly becoming the space where professional life happens. The recent decision by Facebook to update user profile pages to offer a 'LinkedIn style' professional view, suggests that social media, on the whole, is becoming a medium for work as well as play. The global phenomenon of social media is having a significant impact on the world of work and on job markets. Social media is no longer a trend to simply keep an eye on. Instead it informs about strategies and policies across organizations – from internet usage policies to sales and marketing, recruitment and retention, motivation and conflict resolution – the list is endless.

Social media has become a key player in the job search process today. Many of the social Network Sites like Facebook, Twitter, LinkedIn, and Google+ allow employers searching for employees to get a glimpse of who the candidate is outside the confines of his resume, cover letter or interview. The social media not only offers job seekers with an opportunity to learn about companies they're interested in; connect with current and former employees but also hear about job openings instantaneously among other things. This is one of the main reasons probably why half of all job seekers are active on social networking sites on a daily basis and more than a third of all employers utilize these sites in their hiring process. Unless job applicants have strict settings on their social media accounts, they may broadcast revealing details about their lives, including their drinking habits, political views, weight, race and marital status.

Social media can be fast, efficient and cost effective when used as a recruitment tool and has improved the recruitment process by making it more open and democratic. It now plays a key role in the evaluation of individuals. Because social media sites are proliferating and changing rapidly recruiters and companies will have to work more closely; in order to take full advantage of the hiring solutions it can offer.

In this paper we have proposed an approach of converting the different aspects of the SSNs into parametric form which can be used by employers in deciding which gaffes are acceptable and which are deal breakers. Most of the companies now use social-networking sites like Facebook, LinkedIn, MySpace and Twitter to screen potential candidates. The rest of the paper is organized as: Section II contains the related work. Proposed model with problem definition is given in section III. In section IV methodology of this work is

discussed. Results are presented in Section V followed by conclusion and future work in section VI.

II. LITERATURE REVIEW

In paper [1] an analysis framework incorporating industry best-practices and tools to perform large-scale analyses is presented. The framework presented integrates the expressiveness of Pig, the scalability of Hadoop, and the analysis and visualization capabilities of R to achieve a significant increase in both speed and power of analysis. Evaluation of the framework on a large dataset of real measurements from perfSONAR demonstrates a large speedup and novel statistical capabilities. In paper [2] the authors have analyzed the hidden structure of tagging practices for community members in a small and well organized community – PlanetRDF. The authors have introduced an object-centered social network based on tagging practices across different sources and then have shown how this network can be built and emerged over time. In this paper [3] the authors have provided a novel approach for clustering user-centric interests by analyzing tagging practices of individual users. They have collected Really Simple Syndication data from blogosphere and found conceptual clusters using formal concept analysis. They have evaluated the significance of these clusters. The results of the empirical evaluation show that they can effectively recommend different collections of tags to an individual or a set of users. In paper [4] BRINCA project is presented which aims to assist the analysis, visualization and balancing of the scientific social networks in the domain of cancer research. This project seeks to analyze patterns in relationships following the creation of the Brazilian institutes, a mechanism to stimulate collaboration between the universities and research institutions that deal with issues that are strategic for the country. Paper [5] tried to apply cloud computing technology in social network analysis for a comprehensive home financial learning environment that individual investors may use as a reference in establishing web-based learning and investment platforms. This paper advanced the social network analysis technology to be able to handle millions of nodes and links. The authors performed several intelligent analyses on a very popular social network, IHFILE, to identify some interesting and important features of it. In paper [6] the authors made a comparison of SNSs: Facebook, Twitter, Google Plus and Schoology in various features that related to the use and application for teaching and learning management. Application of using SNSs with available online tools: YouTube, Skype, Dropbox, Google Docs and Google Calendar to assist in teaching and learning management are presented in this article. In paper [7] X-RIME: a Hadoop-based analysis tool for large-scale social network is proposed. X-RIME can efficiently deal with large-scale data sets with great expandability and universality. The authors have briefly analyzed the necessary features for an algorithm to be implemented with Map Reduce programming model in a distributed and concurrent way. The SNA abilities of X-RIME with extensive experiment results are also analyzed. In paper [8] a model of a novel application, Like-minded People Recommendation (LmPR) is presented. LmPR recommends like-minded people to users in SNSs automatically based on text mining and collaborative filtering technologies. LmPR is able to help people to locate latent learning partners with similar interests and concerns. Through the use of LmPR, people are encouraged to spontaneously form a Community of Practice (CoP) to enhance the interactions among their learning community formed by like-minded people. In paper [9**]** opportunities for future research like extracting the data from the online social networking profiles using a depth first search, development of the application to extract all the friends and their attributes from the profile rather than just the top or random friends, projection of profile connections from the repository into a graph, development of an agent to automate the process of data retrieval, run the application over a period of time to track the changes in the online social network are highlighted to help the researchers to find the suitable domain. Paper [10] includes the survey study of social networking sites right from mathematical graphs to analyzing social networks using Semantic Web. This paper provides the research domains on different aspects of Social Network Analysis. Different methods to show social networks and their properties are studied. The analysis of Social network provides some useful tools for addressing many aspects of social structure**.**

III. PROPOSED MODEL

The recent trend of the employers of finding whether the candidate is suitable for the job he has applied for and consistent with what he has written in his resume are using Social Network Sites (SNS) of the candidates for the scrutiny process. But there isn't any such mathematical model as per our best knowledge which can completely transform this process into certain values belonging to the most important characteristics of an individual/ candidate which are important to the organization.

In this paper keeping in mind these trends of the social networking sites being used by organizations we have developed a method in which we are using the various aspects of a Social Networking Site like the groups joined, pages liked, comments made, events attended in the parametrical form to calculate the suitability of the candidate for the particular post within the organization. To find the most suitable candidates we have used two tools Weka and Hadoop. In Weka the data set given is clustered into suitable candidates and not suitable candidates. The set of Suitable candidates is then used in Hadoop to find the ones who are most suited to the job and can be called on for interviews for further scrutiny.

For the proposed work the following models are used:

A. Data Model

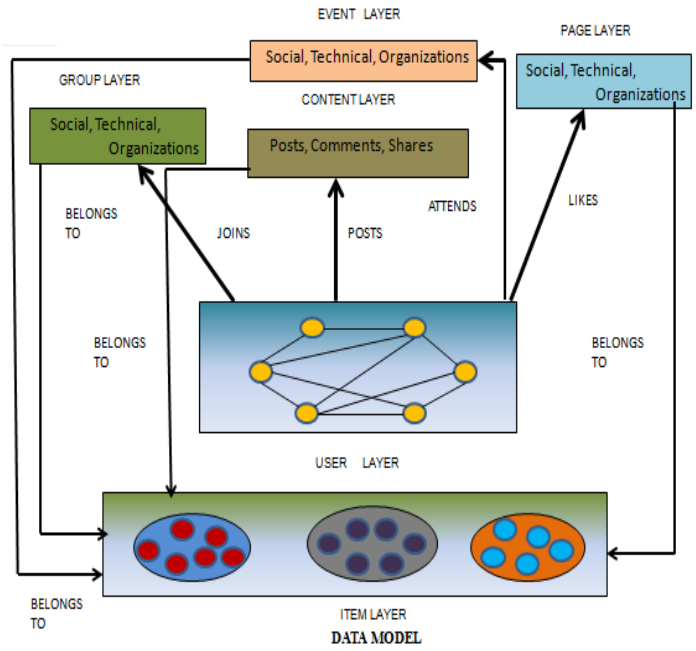

Fig. 1. Data Model

Figure 1 depicts proposed data model.

The data model consists of six layers i.e. Event layer, Group layer, Content layer, Pages layer, User layer and Item layer. First four layers are at same level. The layer at the second level is the User layer having a group of friends associated with each user. The third level layer is an Item layer. The first four layers basically help us to find the behavior of a user which will in turn helps us to find the suitability of the user for hiring purposes.

Event layer includes the various social and technical events being *ATTENDED* by a user.

Every user has some groups in social networking site (SNS) which he may have *JOINED* depending upon his interests. The Groups joined by the user can be divided into two categories i.e. Social and Non social (technical etc.).

Each user *SHARES* a lot of content on the social networking site which can be categorized into Shares, Posts and Comments.

Pages Layer included in the first layer is related to the likes and the dislikes of the user. The pages being *LIKED* by the user again can be categorized as the ones which are social and the ones non social i.e. Technical pages, organization pages etc.

The second layer of the data model includes the User Layer. This layer includes the user and the friends' i.e. the other users which are in the friend list.

The layer at the third level is the Item Layer. Each of the Group, Event, Page and even Content (shares, posts and comments) *BELONG TO* this layer.

B. Database View

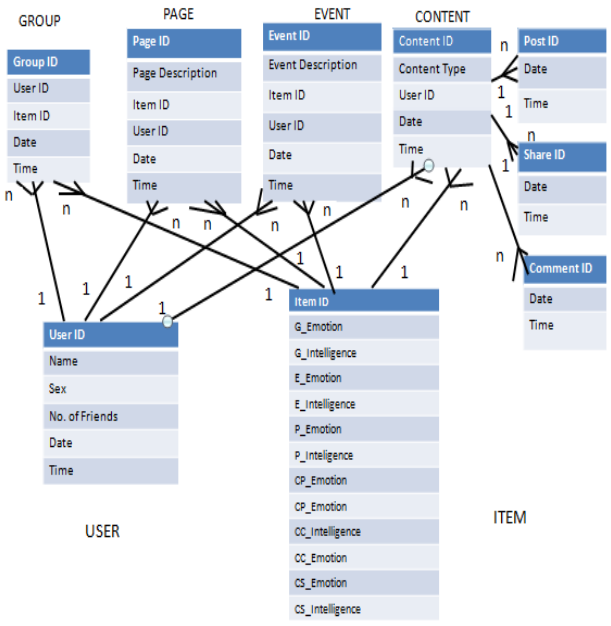

Fig. 2. Database View

Figure 2 shows the tables of database of the proposed data model.

The database created for the above explained data model includes nine tables i.e. *Group, User, Page, Event, Item, Content, Post, Share and Comment.*

1) The attributes of Group Table are: Group ID, User ID, Item ID, Date and Time.

2) The attributes of User Table are: User ID, Name, Sex, Number of Friends, Data and Time.

3) The attributes of Page Table are: Page ID, Page Description, Item ID, User ID, Date and Time.

4) The attributes of Event Table are: Event ID, Event Description, Item ID, User ID, Date and Time.

5) The attributes of Item Table are: Item ID, G_Emotion, G_Intelligence, P_Emotion, P_ Intelligence, E_Emotion, E_ Intelligence, CP_Emotion, CP_ Intelligence, CS_Emotion, CS_ Intelligence, CC_Emotion, CC_ Intelligence.

6) The attributes of Content Table are: Content ID, User ID,Content Type, Date and Time.

7) The attributes of Post Table are: Post ID, Item ID, Date and Time.

8) The attributes of Share Table are: Share ID, Item ID, Date and Time.

9) The attributes of Comment Table are: Comment ID, Item ID, Date and Time.

There are multiple Groups and each group has unique ID. Different users JOIN different groups depending upon their interests and they belong to a particular User ID. Similar is the case with the Events, Pages and Contents.

In Item table we are having different attributes as G_Intelligence and G_ Emotion etc. All the Groups joined by the user will either belong to the G_Intelligence or

G_Emotion. For each such group for a particular User Id an increment in the number (Integer type) stored in G_Intelligence Or G_Emotion will occur. Similarly the pages Liked, Contents (Shares, Posts and Comment) added, Events attended by a particular user having a particular User ID will be categorized into *_Intelligence or *_Emotion depending upon the interest of the user (where * can be Group, User, Page, Event, Item, Content, Post, Share and Comment).

These numbers added to each attribute of the Item Table belonging to a particular user Id will help the employers to find about the Emotional and Intelligence level of the user which can be further used to find out whether he/she is suitable for that particular job or not.

Each table in the database except the Item table is having attribute Date and Time which is used to basically help in analyzing the data from a particular amount of time say three months.

IV. METHODOLOGY

A. Technique Used

For selecting the suitable candidate for a particular job in an organization, four parameters are used to find the suitability. They are:

- Groups Joined (G)
- Events attended (E)
- Pages Liked (P)
- Contents: Posts, Comments and shares (C: CP,CC,CS)

TABLE I
PARAMETERS USED TO FIND THE SUITABILITY

	G			**P**		
	Low	***Avg***	***High***	***Low***	***Avg***	***High***
Actual Value	G<75	75<=G<=150	G<150	P<100	100<=P<=200	P<200
Assigned Value	1	3	5	1	3	5

E		
Low	***Avg***	***High***
E<50	50<=E<=100	E< 100
1	3	5

We have defined the range for the above mentioned parameters. Each parameter is having a particular range values which defines whether the value falls under Low, Average or High category. The ranges are shown in the Table I in the row titled Actual Values.

These actual values obtained from the database are mapped into Low, Average and High Range values which are 1, 3 and 5 respectively. These values are show in the Table I in the row titled Actual Values.

TABLE II
SUBPARTS OF CONTENT PARAMETERS USED TO FIND THE SUITABILITY

	CP			**CS**		
	Low	**Avg**	**High**	**Low**	**Avg**	**High**
Actual Value	CP<250	250<=CP<=500	CP<500	CS<250	250<=CS<=500	CS<500
Assigned Value	1	3	5	1	3	5

CC			**Avg C**
Low	**Avg**	**High**	
CS<500	500<=CS<=1000	CS<1000	CP+CS+CC/3
1	3	5	

C		
Low	**Avg**	**High**
1<=Avg C<2.3	2.3<=Avg C<3.6	3.6<=Avg C<5
1	3	5

For calculating the Content values we have taken three parameters Content Posts (CP), Content Share (CS) and Content Comments (CC). Again like the parameters defined before these sub parameters under the Content category are having range values. The values obtained from the user database for these parameters are mapped into low (1), Average (3) and High (5). This is depicted in the Table II in the row titled Assigned Value. These Assigned values for the parameters CP, CS and CC are averaged for the particular User ID i.e.

$$Avg\ C = Sum\ (CP+CS+CC)/3$$

For calculating the value of C from Avg C, again three range values are taken i.e. if the range is 1<=Avg C<2.3 then the value is 1, If 2.3<=Avg C<3.6 then value is three and for range 3.6<=Avg C<5 value is 5.

For computing the Emotional Quotient associated with a particular User ID four parameters i.e. Group_Emotion(GE), Post_Emotion(PE),Events_Emotion(EE),Content_Emotion(CE) are used.

TABLE III
PARAMETERS USED TO FIND EMOTIONAL QUOTIENT

	GE			**PE**		
	Low	**Avg**	**High**	**Low**	**Avg**	**High**
Value	1	3	5	1	3	5

EE			CE			Emotional Quotient
Low	Avg	High	Low	Avg	High	GE+PE+EE+CE
1	3	5	1	3	5	

Emotional Quotient = GE+PE+EE+CE

For computing the Intelligence Quotient associated with a particular User ID four parameters i.e. Group_Intelligence (IE), Post_Intelligence (PE), Events_Intelligence (EE), Content_Intelligence (CE) are used.

TABLE IV
PARAMETERS USED TO FIND INTELLIGENCE QUOTIENT

	GI			PI		
	Low	Avg	High	Low	Avg	High
Value	1	3	5	1	3	5

EI			CI			Intelligence Quotient
Low	Avg	High	Low	Avg	High	GE+PE+EE+CE
1	3	5	1	3	5	

And again, *Intelligence Quotient = GI+PI+EI+CI*

Different organizations have different criteria for selecting the most suitable employee. Here it is assumed that the employee having the value of the selection criteria in between 32 and 40 will form a set of suitable employees.
Thus, Selection_Criteria = EQ+IQ.

Suitable employees are those which are in between
32<= Selection_Criteria <=40

B. Mathematical Model

We have generated a data set for the experimentation purposes having User ID and the values corresponding to all the parameters G, P, E, CP, CS, CC according to the range values we have defined in the above section for both i.e. calculating Emotion and Intelligence quotient. These values are mapped into the values of 1, 3 and 5 depending upon the range category they belong into i.e. Low, Average and High. The values of the content i. e. CP, CS and CC are averaged and the value obtained Avg_C and Avg_CI is used as a parameter for calculation of the Emotion Quotient and Intelligence Quotient respectively.

For the calculation of the Emotional Quotient the parameters chosen were:

GE, PE, EE, Avg CE. All these values either can be Low, Average or High. But in case of GE and Avg CE which basically define the social behavior and working in a Team capability of the user/candidate, they are meant to be high i.e. having a value of 5. Thus keeping them fixed i.e. high, makes a value of 10 which is going to be fixed for our selection criteria i.e.

GE+ Avg CE = 10 *Eq. 1*

However, the other two parameters i.e. PE and EE can be compromised a little bit i.e. they can either be having Low or Average or High value.

Taking all the eight combinations for PE and EE i.e. LH, LA, LL, AL, AA, AH, Hl, HA and HH:

TABLE V
COMBINATION OF PE AND EE PARAMETER VALUES

Low-1, Average-3 and High -5		
PE	EE	SUM
Low	High	6
Low	Average	4
Low	Low	2
Average	Low	4
Average	Average	6
Average	High	8
High	Low	6
High	Average	8
High	High	10

For defining the selection criteria range we consider the lowest sum value of all the parameters from Table V i.e. 2.

Lowest range value = 2 *Eq. 2*

Considering the Intelligence quotient parameters nothing can be compromised in the Intelligence of the candidate. Hence all the parameters taken for the calculation of the Intelligence Quotient i.e. GI, PI, EI and Avg CI need to have fixed value i.e. High (5). Thus the value should come to be

GI +PI +EI + Avg CI =20 *Eq. 3*

For deciding the range for the most suitable candidates to be selected we have

The lowest range value of selection_criteria is to be:

10+20+2= 32 *(From Eq. 1, 2 and 3)*

The highest range as obvious would be number of parameters multiplied by High value i.e. 5

8 (parameters) 5(value of High) = 40*

Thus Selection Criteria comes to be:

32<= selection_criteria <=40

V. RESULTS

For practical implementation of proposed work we have used two tools i.e. Weka and Hadoop. Weka tool is used to get the two clusters of suitable and not suitable candidates. The output of Weka is passed to Hadoop to find the most suitable candidates for the job.

A. Results obtained using Weka

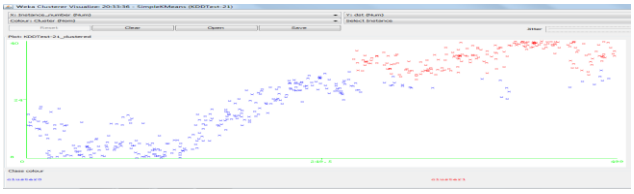

Fig. 3. Snapshot of computed clusters

Figure 3 shows the clustering of the User IDs (ssn_wholedataset) into two categories the suitable (in red color) and not suitable ones (in blue color).

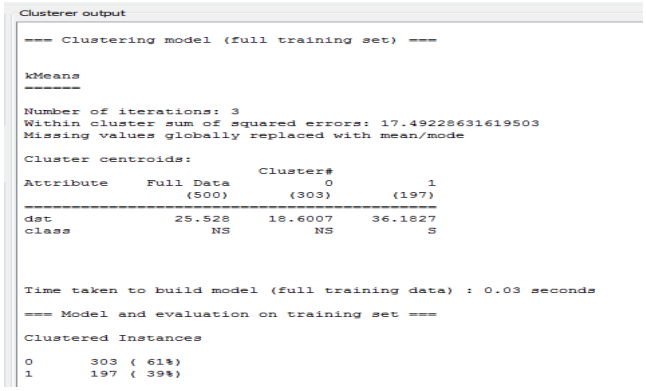

Fig. 4. Snapshot of Cluster Computation in Weka

Figure 4 shows the results obtained after passing of 500 records to the Weka tool. A data set of 500 records was passed as an input to WEKA tool and the results obtained were:
Suitable Records: 197
Not Suitable records: 303

B. Results Obtained using Hadoop

The suitable Record set is taken to the Hadoop Platform for choosing the most suitable candidates from the suitable candidates dataset.

The data file is loaded in hadoop and a table is created from this ssn_dataset file named ssn_data. The table created is having four columns named Factor , Emotion, Intelligence and Prob. The datatype of these colmns are string, int, int, int respectively.

*Select *from ssn_data where prob = 40*

is the Beehive query which is written for accessing the data table stored in Hadoop. The results obtained include 57 records having the values where prob = 40. These results are saved in tabular form in results_selected table.

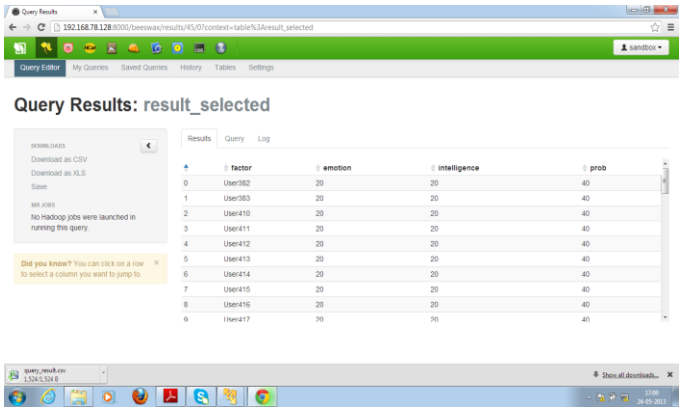

Fig. 5. Snapshot of Query Results

Figure 5 shows the Query Results obtained, a total of 57 records are there, who are the most suitable candidates. The users selected whose Prob = 40 are as:

TABLE VI
SELECTED USERS HAVING THE PROB VALUE EQUAL TO 40

User IDs of Candidates					
382	383	410	411	412	413
414	415	416	417	418	419
420	421	422	423	424	425
426	427	428	429	430	431
432	433	434	435	436	437
438	439	440	441	442	443
444	445	446	447	448	449
450	451	452	453	454	457
458	459	460	461	462	463
464	485	500			

But it's quite possible that the employers want candidates belonging to a particular range for further scrutiny. So the range checked in between 38 and 40

*Select * from ssn_data where Prob BETWEEN 38 AND 40*

The above statement is the Beehive query written in Beehive Query editor for accessing the data table stored in Hadoop. This Query for selecting the records where Prob ranges between 38 and 40.

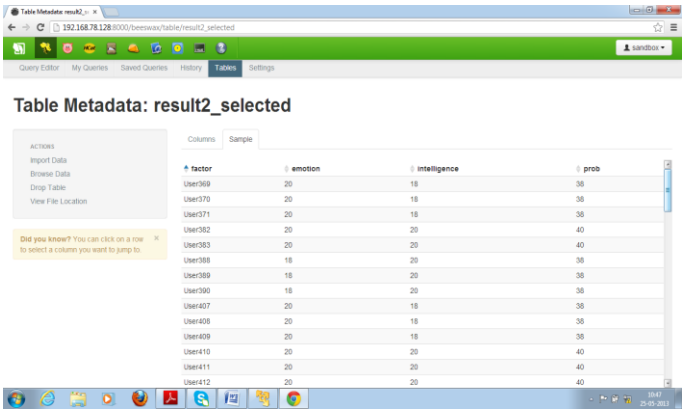

Fig. 6. Snapshot of Query Results

Figure 6 shows the results obtained for the second query executed and total 70 records are matched.
The users selected in the range of 38 and 40 are as:

TABLE VII
SELECTED USER IDs HAVING THE PROB VALUE BETWEEN 38 AND 40

User IDs of Candidates					
369	370	371	382	383	388
389	390	407	408	409	410
411	412	413	414	415	416
417	418	419	420	421	422
423	424	425	426	427	428
429	430	431	432	433	434
435	436	437	438	439	440
441	442	443	444	445	446

447	448	449	450	451	452
453	454	457	458	459	460
461	462	463	464	481	482
483	484	485	500		

TABLE VIII
SELECTION OF SUITABLE CANDIDATES USING WEKA

Suitable Candidates	Not Suitable Candidates	Total Candidates
197	303	500

TABLE VII
SELECTION OF MOST SUITABLE CANDIDATES USING HADOOP

Most Suitable Candidates	Suitable Candidates not shortlisted	Suitable Candidates
57	140	197

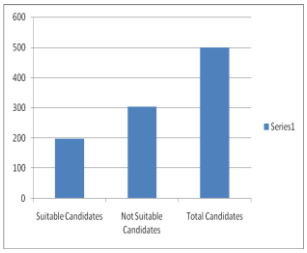

Fig. 7. Graphical representation of results of obtained using Weka

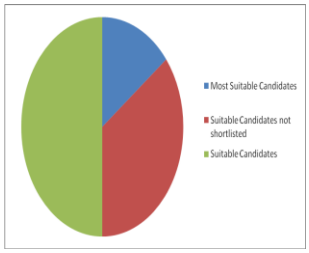

Fig. 8. Graphical representation results obtained using Hadoop

Figure 7 is the graphical representation of the number of suitable candidates obtained using Weka. Figure 8 is the graphical representation of the number of most suitable candidates obtained using Hadoop.

The dataset of 500 candidates is being analyzed by proposed method. Total candidates found within the suitable set are 197 in number. By taking selection criteria to be in the range of 38 to 40, we get 70 most suitable candidates (Refer Table VI). By enhancing the competition in order to select the best candidates the Selection_Criteria is increased to 40. In this case, the most suitable candidates found are 57 in number (Refer Table VII).

VI. CONCLUSION

We have proposed a technique for converting the behavior of an individual/candidate on the Social networking Site (SNS) into parametric form i.e. Emotional Quotient(EQ) and Intelligence Quotient(IQ) which can be further utilized by an organization for selecting the suitable candidates. These two parameters added together give the value of the Selection Criteria which if falls in a particular range as per the Organization's requirement leads to the selection of those candidates.

- The data of the social networking sites which was just being a way of an individual to represent his feelings or views regarding the hot topics etc. now can be utilized by this proposed model to define the personality in terms of Emotion and Intelligence which is very useful for the organization hiring individuals.
- The proposed method also reduces the overhead of the selection process by obtaining the set of most suitable candidates and thus reducing time and money incurred by the organization in this process.
- This method also helps in choosing the best employees as not only their technical skills required for the job are verified but also the personality of the individual which plays as important role in the survival of the individual within an organization is taken care of.
- One of the most important advantages is that the organization can change the value of Selection_Criteria (Prob) as per their requirements.

We can extend this work by adding more parameters which can be very useful to determine the psychology which is also considered as an important part of selection criteria.

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