Nodexl Tool for Social Network Analysis

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Abstract: Billions of people interact with social media daily. However, various users realize how every snap and press produced interactions eventually led to a large social network structure. Enthusiastic social media users, including mailings, pages, microblogs, and wikis, are willing to send personal or public messages, express strong views, raise awareness of the community in building partnerships, foster cultural heritage, and advancing growth. Social media professionals build, create and share digital content to tug together or develop resources to integrate their experiences, express their creative ideas. and offer support for friends and partners. The results are wide, dynamic networks connecting people with other residents, books, sites, ideas, and different articles. New tools are now capturing, analyzing, sharing, and creating knowledge through texts, folders, forums, blogging, uploading photos and videos, reviews, and concepts through the utilization of trillion experiences. The unseen connections between each folks are now more accentuate and available by machines as social media also appear as a standard forum for user interaction. Consequently, social network analysis will identify local and global trends, identify prominent actors, and analyze network dynamics, creating new potential for an exhaustive and groundbreaking visualization of a social network.

Keywords: Social network, Analysis, NodeXL, Twitter analysis.

1. Introduction

The classical social network analysis (SNA) is used to map and investigate the relationships and flows between networkers, groups, organizations, computers, URLs, and many others. Network nodes are individuals and classes, and interactions between nodes show relationships or variations (**Aldahdouh, Mahmoud & Aldahdooh, 2019**). Thus, SNA gives a visual and quantitative analysis of human interactions. This approach applies to its business customers and is called the ONA research network by management consultants. According to SNA, there are two-level used in analysis processes, the individual and organizational level.

The analysis unit at the individual level is an entity made up of a collection of individuals and their connections (**Benson, 2006; Yu et al., 2003**). Network methods concentrate on dyads (a couple of actors and their linkages), triads (three actors and their associations), or large systems (subgroups of individuals or entire networks) are a central focus of network methods. Social networks, social and networking network notices, parenting, disease transmission, and sexual relations are typically viewed in social media analyzes (**McCulloh et al., 2013; PEW RESEARCH CENTER, 2013**). They analyze the Network's role in recognizing the networks and their members. The direction of the Network determines the centrality of the node. Such measures will provide us with insights into the various positions and clusters of the Network, which are the nodes, mavens, leaders, ties, isolates, where and in whom the groups are, who is at the center and on a periphery of the Network while the analysis data flow as shown in Fig.1.

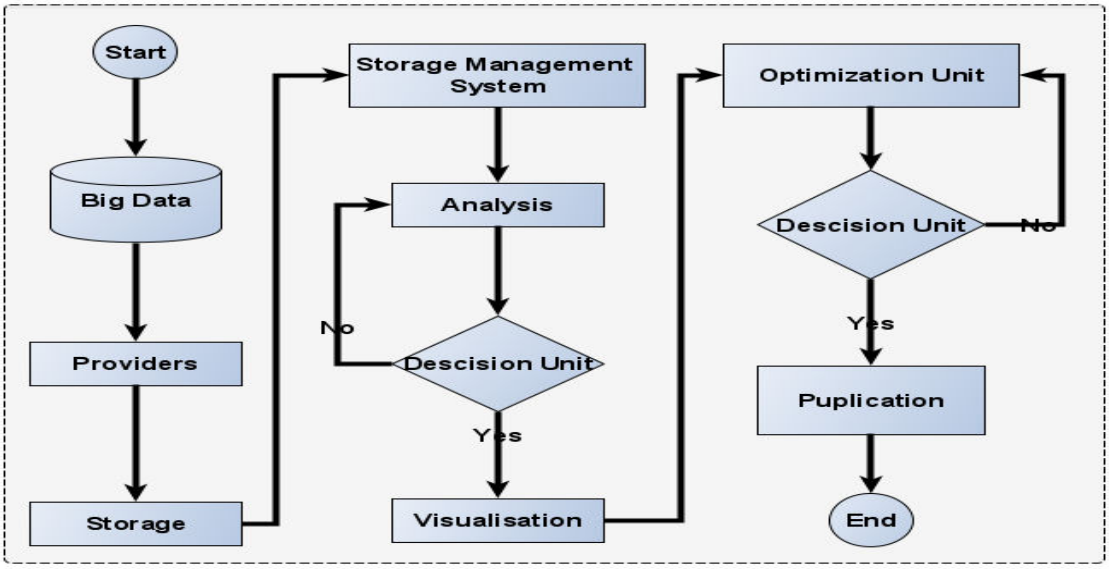

Figure.1 Network analysis data flow

Each step is user-configured and can then be performed in a batch. Using the standard table interface, users can interact with the Network. Social network modeling is used to (i) Recognize the importance of informal networks, (ii) Recognition of fragmented teams or individuals, and bottlenecks in the contact. (iii) To facilitate identifying who knows who and who could conceive of the primary roles of thinkers, fundamental knowledge traders, and specialists of the departments and individuals. (iv) Enhance the efficiency of formal and informal communication channels. (vi) work to enhance knowledge flows strategically. (v) Accelerate the exchange of reconnaissance and knowledge across functional and organizational limitations. (vii) Visualize relations between the organization and outside it **(Barash & Golder, 2011; Packwood, 2011**).

2.Twitter SocialMedia

Twitter is almost too essential: a stream of messages that people find attractive in a list of individuals, companies, and celebrities and an empty box. The people can send concise messages to those who see them as beautiful. Nevertheless, one of the keys to its success was the Twitter brass-tacks design. Twitter has become one of the most successful, talked about, and flexible social media platforms in recent years by customizing and developing a broad base of users and third-party developers. Millions of users have been rapidly attracted, and political candidates have reached voters via campaigns and office. Twitter is a social networking online service that allows participants to send and receive a short message of 140 characters in length, known as ' tweets.' Thus, Twitter can be considered a microblog for conversation.

In contrast to blogs, Twitter users are publishing messages in feeds of all subscribers. The architecture of Twitter thus represents the simplicity of RSS. Twitter or called later Twitter established in March 2006 and started in July of the same year. With more than 100 million users sharing about 340 million tweets per day in 2012, Twitter service quickly gained global popularity and handled 1.6 billion search queries daily. As of December 2014, the service has over 500 million tweeted messages, of which over 284 million are daily registered service users (**McCulloh et al., 2013**). In addition, Twitter was one of the top ten websites visited by most people.

Social media for business is not any longer ex gratia. It is a hearty thanks for reaching customers, gain valuable insights, and grow whole. To name a few benefits of Twitter are as follows: social media is an easy way to learn from a distance. Imagine there are 9.100 tweets just in one second. Social media support is more efficient by targeting consumers. Social media can help analysts discover and grow reach. The analyst will acquire instant response and feedback from the customer's perspective on social media. Developing business intelligence and improve competitive advantage in social media. Social media can help to increase web traffic and ranking for search. Create meaningful relationships with consumers via social media. Social media helps raise awareness of products and achieve the objective with little or no

budget (**Amri, 2020; "Eleazar Wheel. Lett. to Georg. Whitefield, 1767 December 17," 2015**). Because of their value per second, on average, Twitter tweets over six thousand, equal to over three hundred thousand tweets sent a minute, five hundred million regular tweets, and about 200 billion tweets a year. The following diagram shows the number of tweets per day over Twitter and Twitter users worldwide, as shown in Fig.2 from 1st quarter 2010 to 1st quarter 2019 in millions.

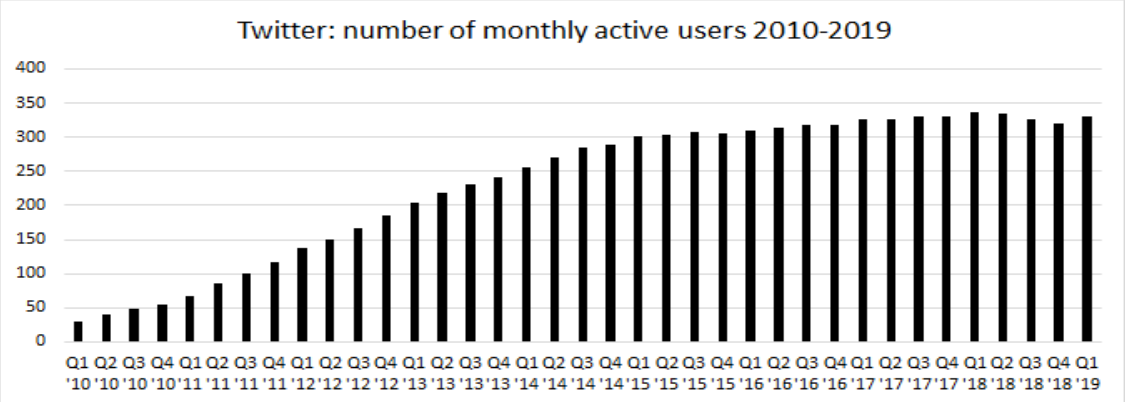

Figure.2 Number of monthly active Twitter users worldwide from 1st quarter 2010 to 1st quarter 2019..

3.Social Network Analysis

Social media are getting visible within the using applications like Facebook, YouTube, or Twitter. Still, the use of social media tools in firewalls protects most firms, organizations, and institutions. The employees in these companies exchange documents, post messages, engage in extensive discussions, document databases, and establish detailed communications practices with other staff and other services. Networked networking has been a vital bridge to clients and suppliers and a crucial internal nervous system across all trade aspects. Social media platforms facilitate internal debates that increase the quality, minimize costs, and allow customer and partner networks to develop and open new opportunities for collaboration, marketing, publicity, and client support. If companies adopt email tools, mail boards, blogs, wikis, sharing documents, and sources of interaction, they create several social network data structures. So, contain information with considerable business value by revealing the critical and particular roles of the business network participants. The methods of social analysis allow researchers and managers of social media to make better choices based on a deep understanding of social participation and ties. SNA platforms include UC-NET, Pajek, SocialAction, and NodeXL. There are many different tools available. The intensified interest by researchers and practitioners for the development, altering, fighting, and superb of these social networking users' groups often allows users to disclose patterns, clusters, potential trends, and external users, also in complicated SNs. The proliferation of technological instruments for the analysis and visualization of SNs is high. Still, many of these are hard to use, particularly for those deficient in programming language skills. The social network analysis software article NodeXL, an open-source platform, was explicitly created for learning about social network analysis concepts and methods by using visualization as an essential component. Wikipedia and recent survey papers offer an overview of up-to-date software for social network analysis.

4.Knowledge Representation

NodeXL, the free and open 2007/2010/2013 Excel add-in. NodeXL is a social media research foundation1 collaboration, a nonprofit organization that develops available software, open-data, and open-source scholarships for social media. NodeXL supports network overview, discovery and offers the opportunity to explore, then NodeXL is the general-purpose network analysis application. The tool allows data flow automation that begins with network data collection and continues in several steps before final network analysis and reporting is generated. NodeXL enables analyst whom non-programmers to create usage statistics for the Network; graphs and visualizations as a typical Excel table. Simple collection and multifaceted functionality can be used to highlight essential network components. NodeXL supports social media exploration with imported applications that collect network information from various sources, including personal desktop email databases, Instagram, Flickr, YouTube, Facebook, Wikis, and WWW hyperlinks. Many sources can be imports via document formats, CSV formats, or GraphML formats.

NodeXL allows the automatic execution of five-step data workflows, beginning from data collection, data management, analysis, and visualization, and finally, publishing from a wide range of network data sources.

5.Materials and Methods

This research shows that using the NodeXL method in social media examines and searches for the hashtag #With_Teacher from the search network on Twitter to identify exciting patterns (**Amri, 2020**). The NodeXL Twitter Search Network Data Collection starts with a Twitter Search message at http:/search.twitter.com. The following statement is sent. Up to 3019 vertices of the required search string are returned. The total numbers of vertices 3019 and 14826 edges are returned on Twitter. Repeated data collection is necessary to study for more extended periods. NodeXL will then handle the resulting set of up to 18,000 vertices. Data are compiled from Twitter reports on the relationships between the authors of the group of data. The results can be found in the workbook NodeXL called "Edges," as shown in table 1.

The NodeXL "Automate" function measures metrics and many other processing steps. NodeXL performs many user-configured network activities without direct user control using "Automate." A good description of steps and procedures for each network graph is given in the manual dialog, as shown in fig. 3 below.

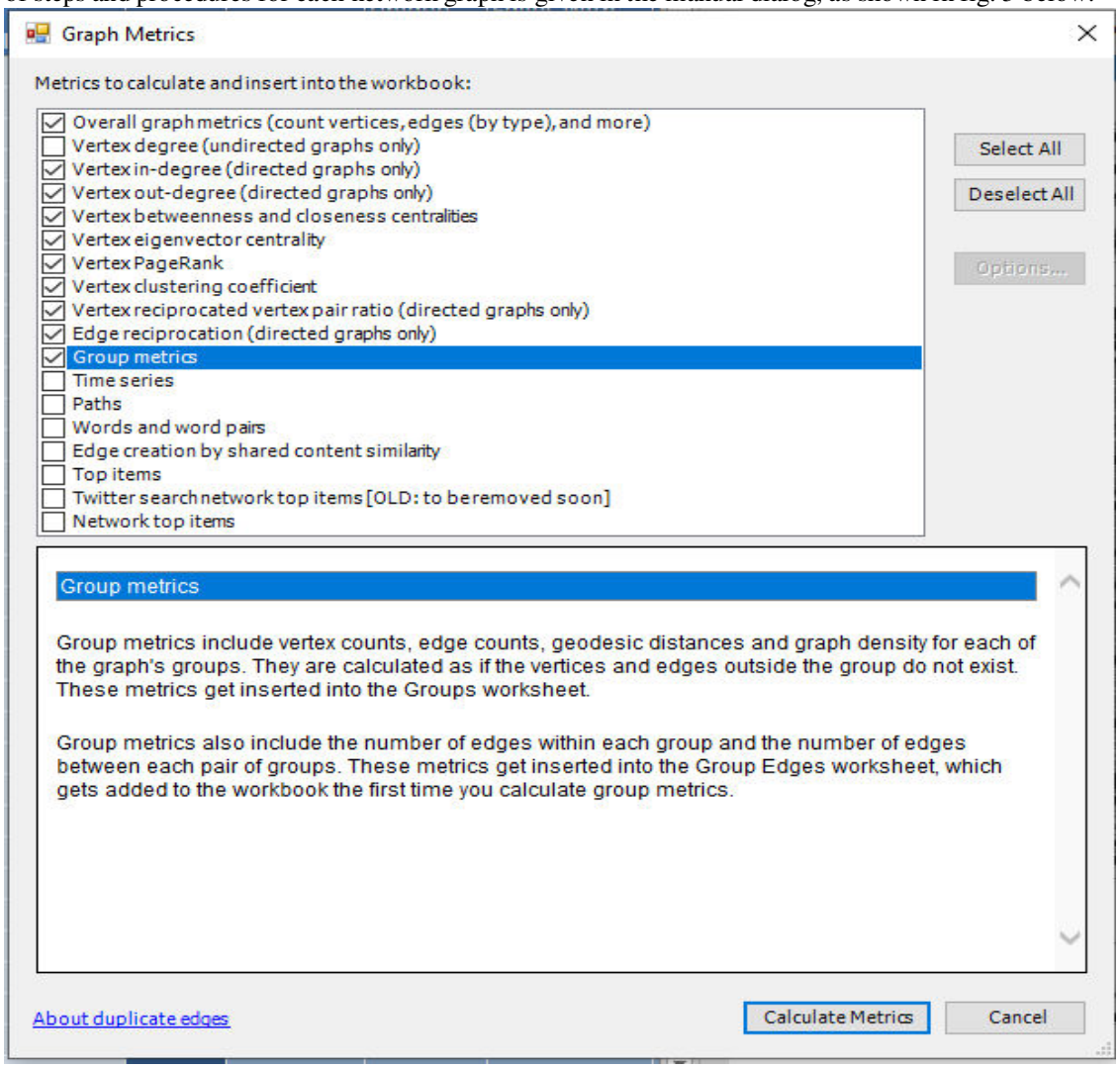

Figure.3Network Structure Metrics determined by NodeXL

Table 1: NodeXL Overall Metrics worksheet contains information that describes the size and density of the network

Graph Metric	Value
Graph Type	Directed
Vertices	3019
Unique Edges	6959
Edges With Duplicates	7867
Total Edges	14826
Self-Loops	3416
Reciprocated Vertex Pair Ratio	0.01778297
Reciprocated Edge Ratio	0.034944522
Connected Components	434
Single-Vertex Connected Components	405
Maximum Vertices in a Connected Component	2550
Maximum Edges in a Connected Component	14148
Maximum Geodesic Distance (Diameter)	8
Average Geodesic Distance	3.247339
Graph Density	0.000860576
Modularity	0.328078
NodeXL Version	1.0.1.439

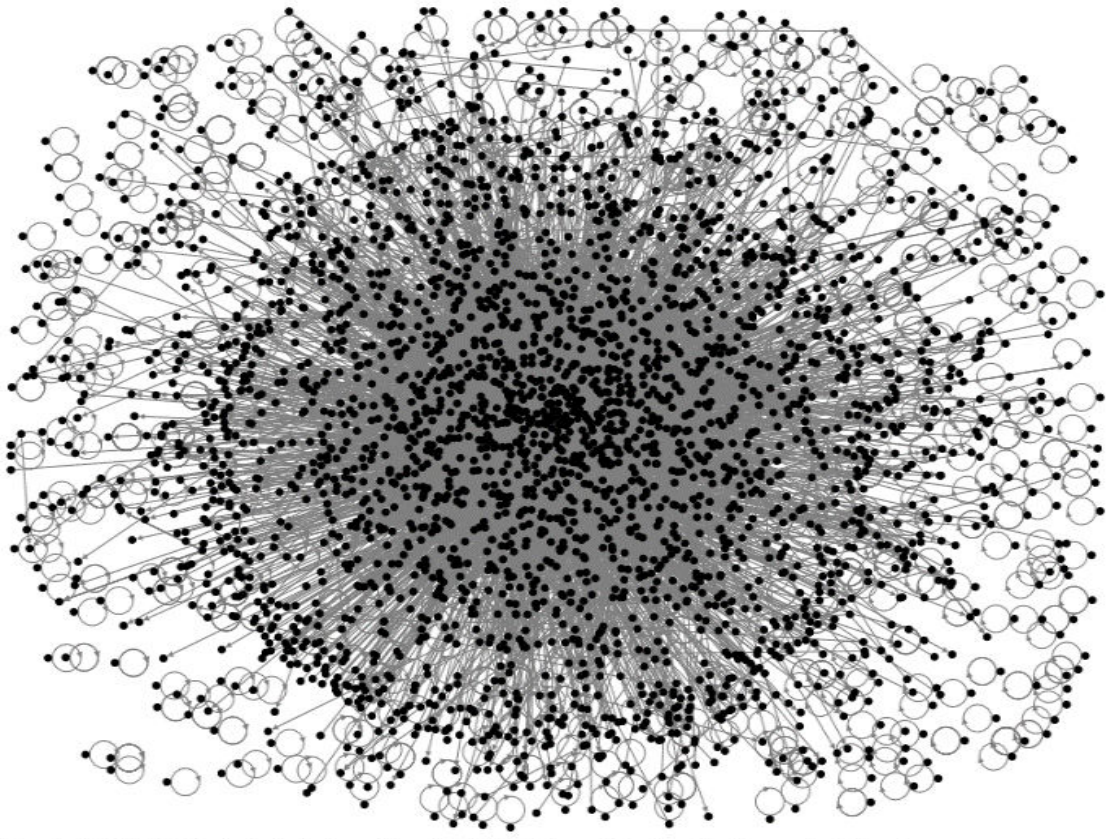

Figure.4 The unprocessed graph visualization of the data sample comprising 3019 nodes and 14826 edges

To show the relationships in the graph, we willbe clustering the dataset in groupsand Show the Clustering Dataset in Graph, as shown in fig. 4 & 5, respectively. In addition to the influential users ranked for the first 50users by their In-Degree, Out-Degree, betweenness centrality, and Eigenvector Centrality score, as shown in table 2.

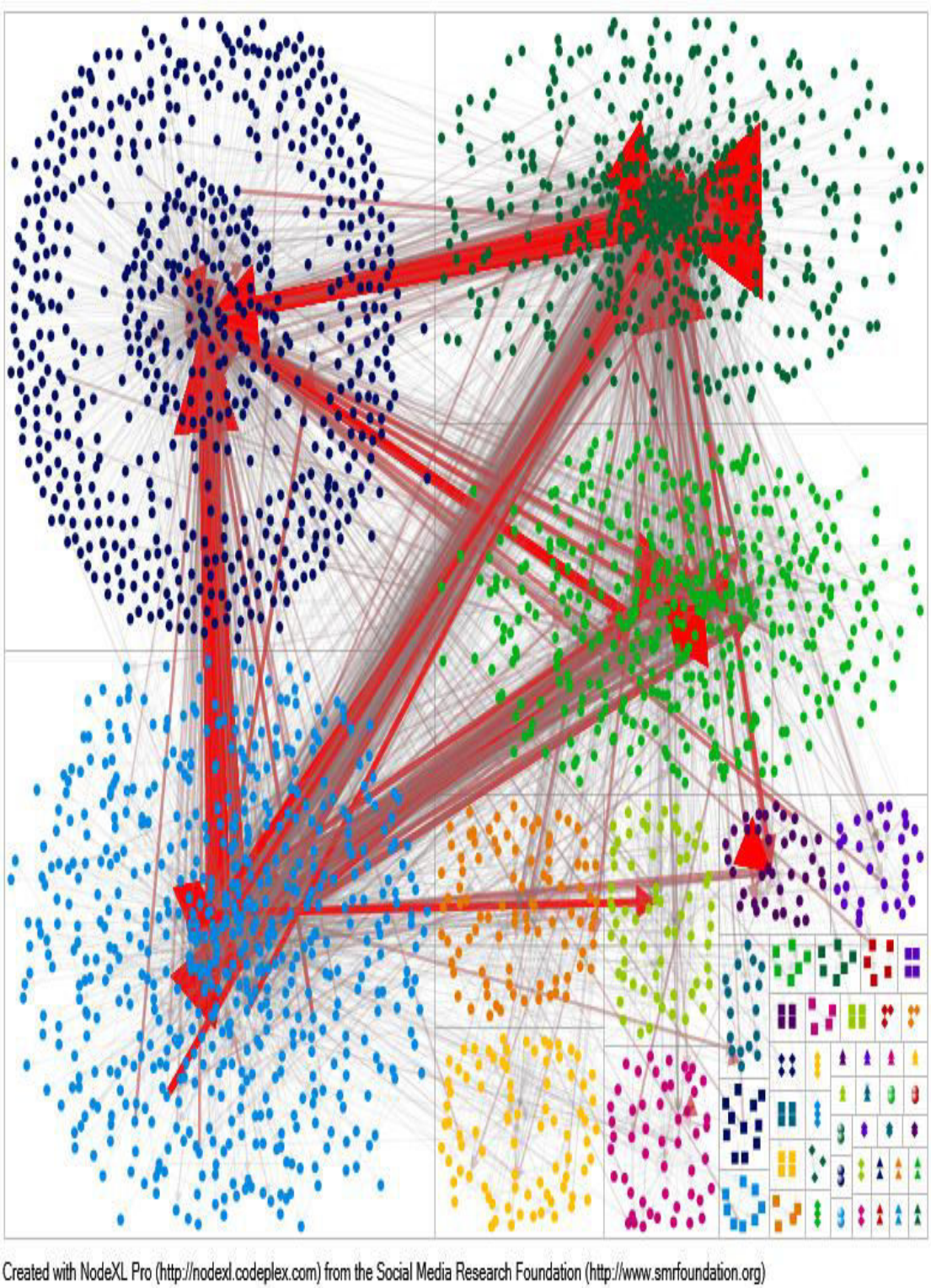

Figure.5*Show Groups Dataset in Graph by NodeX*

Group	Vertex Color	Vertex Shape
G1	0, 12, 96	Disk
G2	0, 136, 227	Disk
G3	0, 100, 50	Disk
G4	0, 176, 22	Disk
G5	191, 0, 0	Disk
G6	230, 120, 0	Disk
G7	255, 191, 0	Disk
G8	150, 200, 0	Disk
G9	200, 0, 120	Disk
G10	77, 0, 96	Disk
G11	91, 0, 191	Disk
G12	0, 98, 130	Disk
G13	0, 12, 96	Solid Square
G14	0, 136, 227	Solid Square
G15	0, 100, 50	Solid Square
G16	0, 176, 22	Solid Square
G17	191, 0, 0	Solid Square
G18	230, 120, 0	Solid Square
G19	255, 191, 0	Solid Square
G20	150, 200, 0	Solid Square
G21	200, 0, 120	Solid Square
G22	77, 0, 96	Solid Square
G23	91, 0, 191	Solid Square
G24	0, 98, 130	Solid Square
G25	0, 12, 96	Solid Diamond
G26	0, 136, 227	Solid Diamond
G27	0, 100, 50	Solid Diamond
G28	0, 176, 22	Solid Diamond
G29	191, 0, 0	Solid Diamond
G30	230, 120, 0	Solid Diamond
G31	255, 191, 0	Solid Diamond
G32	150, 200, 0	Solid Diamond
G33	200, 0, 120	Solid Diamond
G34	77, 0, 96	Solid Diamond
G35	91, 0, 191	Solid Diamond
G36	0, 98, 130	Solid Diamond
G37	0, 12, 96	Solid Triangle
G38	0, 136, 227	Solid Triangle
G39	0, 100, 50	Solid Triangle
G40	0, 176, 22	Solid Triangle
G41	191, 0, 0	Solid Triangle
G42	230, 120, 0	Solid Triangle
G43	255, 191, 0	Solid Triangle
G44	150, 200, 0	Solid Triangle
G45	200, 0, 120	Solid Triangle
G46	77, 0, 96	Solid Triangle
G47	91, 0, 191	Solid Triangle
G48	0, 98, 130	Solid Triangle
G49	0, 12, 96	Sphere
G50	0, 136, 227	Sphere
G51	0, 100, 50	Sphere
G52	0, 176, 22	Sphere
G53	191, 0, 0	Sphere

Figure.6*Clustering the Dataset to Groups in Table by NodeXl*

Table 2. Influential users ranked for the first 50 users by their In-Degree, Out-Degree, betweenness centrality, and Eigenvector Centrality score.

Rank	Opacity	In-Degree	Out-Degree	Betweenness Centrality	Eigenvector Centrality	Followed	Followers	Tweets	Vertex Group
1.	8	886	1	3077126.603	0.014	465	717136	7847	1
2.	100	8	307	831536.255	0.007	38	41	1056	2
3.	100	15	304	776056.411	0.010	23	56	2902	3
4.	100	5	233	522900.619	0.006	6	31	2902	2
5.	8	196	1	330619.167	0.005	0	9479	150	2
6.	93	141	13	322748.720	0.004	3860	43542	65605	2
7.	1	148	0	275935.009	0.004	341	158840	5838	4
8.	100	19	187	224349.541	0.008	112	91	2617	3
9.	1	111	0	203294.670	0.002	190	691294	2140	4
10.	100	16	153	198322.870	0.006	179	70	1390	3
11.	1	159	0	159950.640	0.006	623	4386	26197	3
12.	100	1	166	155752.993	0.007	57	61	2625	3
13.	15	51	2	155054.601	0.001	932	19240	155154	7
14.	100	5	88	132205.674	0.004	21	30	1373	3
15.	100	31	110	130562.785	0.006	294	110	910	3
16.	100	2	35	119179.053	0.000	418	35	501	4
17.	100	6	62	113036.145	0.003	0	37	1138	3

18.	100	10	46	106259.648	0.002	214	19	195	4
19.	100	10	113	104708.241	0.006	127	119	2332	3
20.	100	69	22	103928.390	0.003	304	27081	100034	2
21.	1	77	0	101952.143	0.002	68	271781	46780	4
22.	1	86	0	99530.454	0.003	33	50515	415	4
23.	1	75	0	84581.004	0.002	0	11538	9358	4
24.	1	78	0	83692.580	0.002	62	459770	18341	4
25.	65	47	9	78284.123	0.002	4189	2485	26418	3
26.	1	82	0	74342.615	0.003	675	9109	8332	2
27.	100	10	52	73573.366	0.003	39	3	171	3
28.	29	70	4	73425.112	0.004	1588	1616	2861	3
29.	100	9	19	73284.686	0.001	149	39	183	6
30.	100	36	52	71005.751	0.004	402	412	15997	3
31.	22	46	3	69694.404	0.002	28	1913	379	6
32.	8	54	1	67953.232	0.001	1536	10164	11962	2
33.	100	34	20	66288.964	0.003	37	28	203	3
34.	100	4	29	63417.502	0.001	43	6	126	4
35.	8	37	1	62549.554	0.001	87	2684	650	2
36.	22	40	3	59943.784	0.002	4038	7266	11670	8
37.	100	0	35	59370.9	0.001	609	314	1627	4

				10					
38.	100	17	35	59204.409	0.002	40	72	561	3
39.	100	11	54	57931.321	0.004	75	41	667	3
40.	100	8	42	56979.470	0.002	85	85	300	2
41.	100	2	44	54928.728	0.002	150	8	238	2
42.	100	8	42	53162.225	0.002	31	21	183	2
43.	100	21	20	50147.880	0.002	121	18	336	3
44.	100	10	34	49929.403	0.002	25	9	158	2
45.	100	24	21	48986.967	0.002	339	1235	34172	4
46.	100	2	17	46421.839	0.001	4	7	105	13
47.	100	0	31	45321.344	0.001	1	20	278	2
48.	100	2	34	44596.385	0.002	776	48	408	3
49.	100	4	25	44575.211	0.001	32	3	64	9
50.	58	18	8	43850.296	0.001	1137	604	36412	11

For reference, the default size for labels, the background color behind the network diagram, the color of selected edges, and the scale and magnification of the edges and their arrowheads (see Figures 7 & 8.

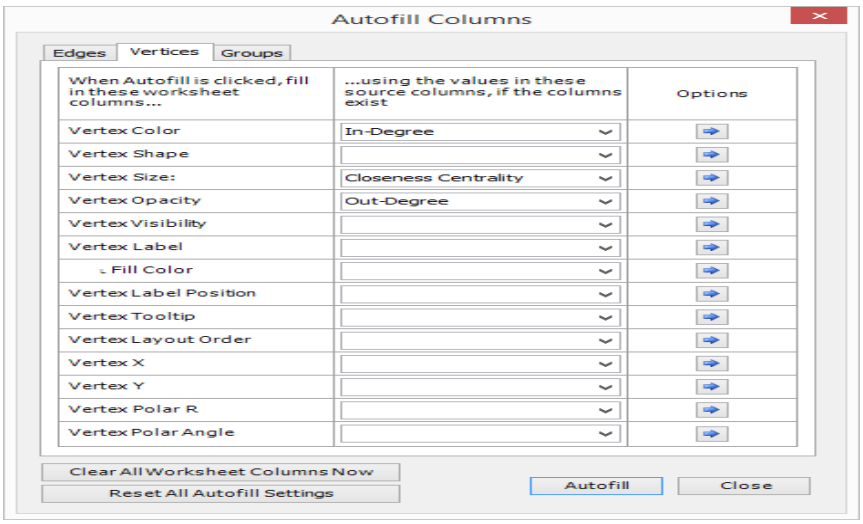

Figure.7*NodeXL Network Graph Visualization Autofill columns*

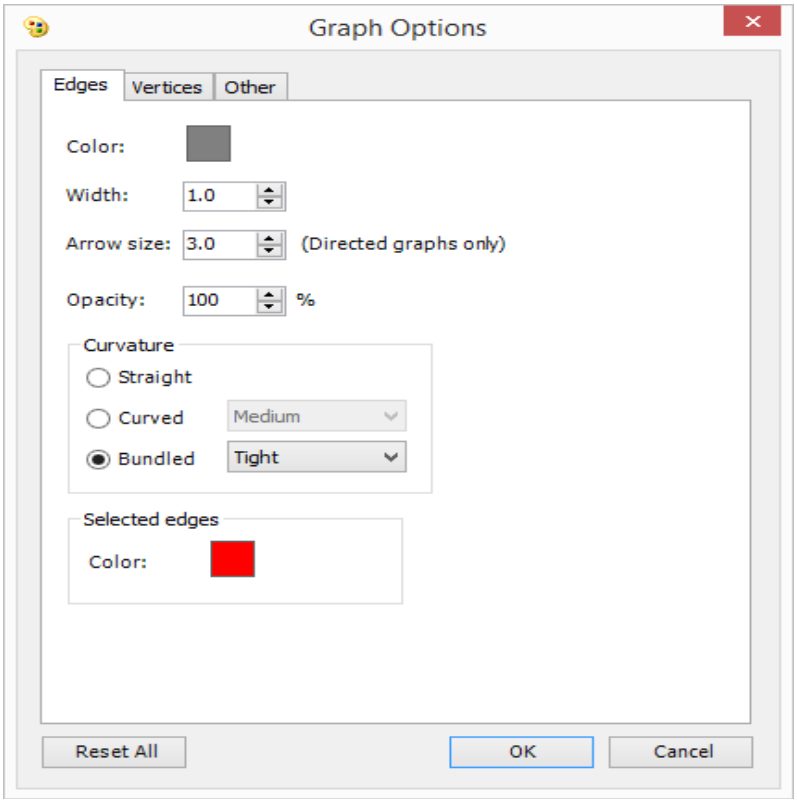

Figure.8*NodeXL Network Graph Visualization Options*

Show image persons who his high degree Betweenness Centrality as in figure 9.

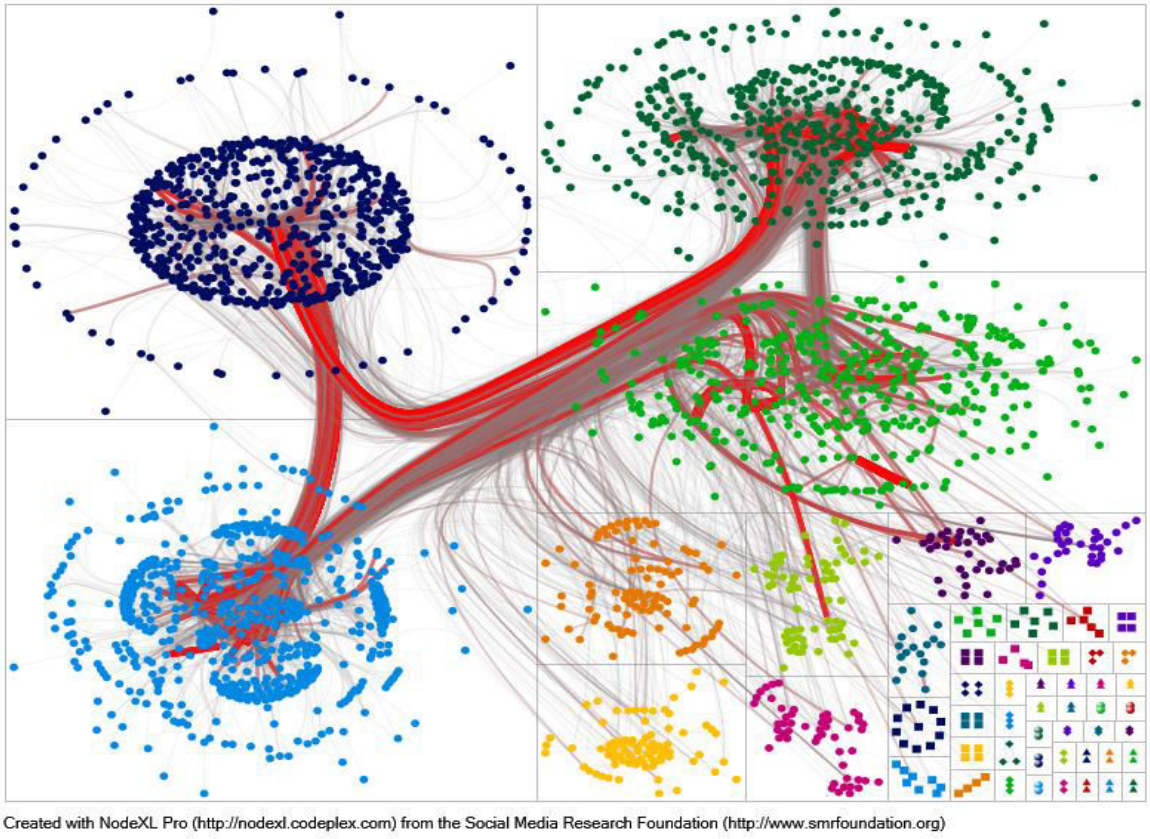

Figure.9*Show images, persons, in Graph by NodeXl*

And then change Fruchterman Reingold layout to Harel- Koren Fast layout figure 8.Each metric of the Network characterizesa different aspect of the size and shape of the graph as a whole and the position and relation property of each individual or entity in the network graph. Therefore, we selected the development of all network metrics accessible via NodeXL. Many of these parameters can be related to a variety of network interface attributes. For example, the vertex's height describing a Twitter user can be multiplied to reflect the number of users that each person has chosen to follow. In addition, NodeXL has a function called "Autofill Columns" to facilitate the selected attributes of graph edges and vertex for making them figure out the features such as the size, color, shape, or transparency of each graph vertex (see Figure 9)(**Matei, 2011**).

Figure.9 *The NodeXL Graph Metrics dialog with all metrics selected.*

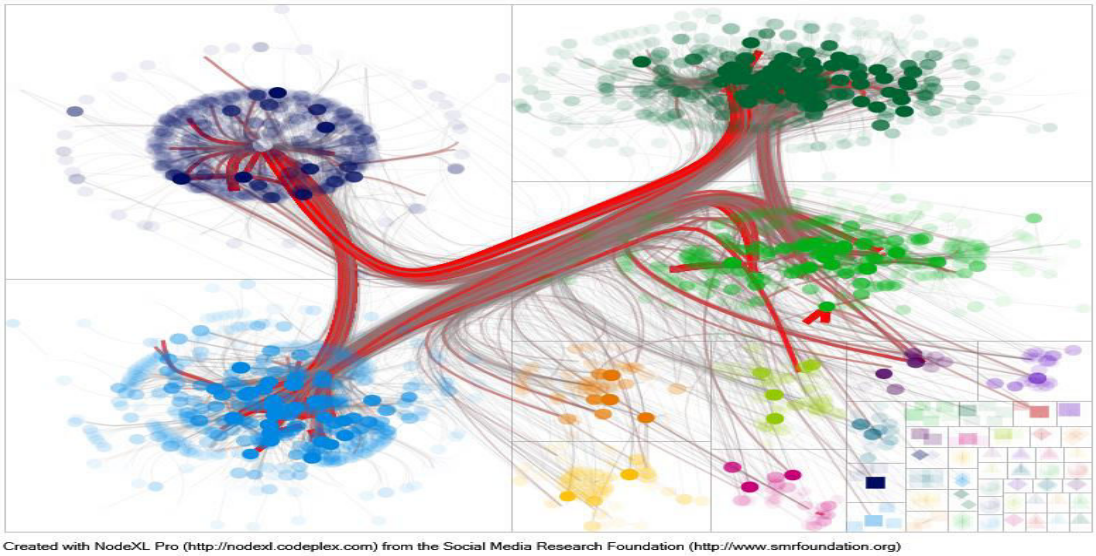

Figure.10 Harel-Koren NodeXl Quick architecture.

Figure.11 *The NodeXL Vertex Color Options dialog the nodes in column In-Degree by vector color*

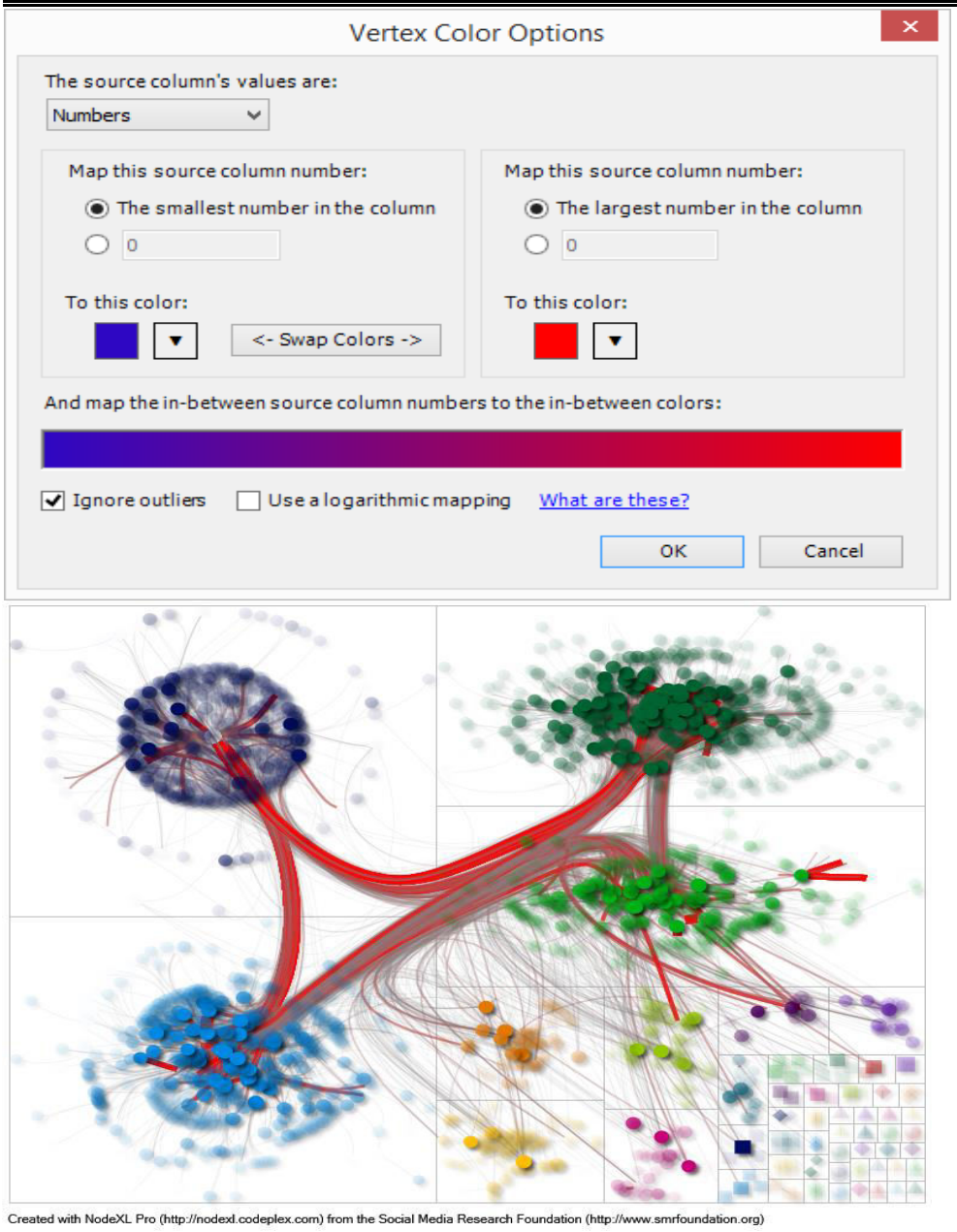

Figure 11. The NodeXL Vertex Color Options dialog allows an analystto set the range for color. For example, setting the content to be from Blue (to smallest number) to Red (to the most significant number in the column) ensures that all vertices are visible and avoids overlap of vertices in the small Network. And size vertex to 100 (high Closeness Centrality) and 20 (low Closeness Centrality).

6. RELATED WORK

Social media are available by using applications such as Facebook and Twitter. Inside these companies, employees share documents, post messages, and establish comprehensive communication patterns with other employees and other information. Networked connectivity has become an invaluable connection with customers and partners and a critical internal nervous system needed for every element of trade. In addition, social media resources promote internal conversations that improve quality and reduce costs (**Matei, 2011**). Using tweets collected from Twitter during the 2010 - 2011 Australian flooding, social network analysis methods were used to create and evaluate the online networks that existed during that period. The objective was to develop an understanding of the online cultures to identify active players and distribute critical information. The secondary goal was to identify valuable online resources disseminated by these communities (**Barash & Golder, 2011**).
They introduce NodeXL, an extensible toolkit for network analysis, discovery, and exploration, as an add-in to Microsoft Excel software. They illustrate the data analysis and visualization features of NodeXL with a selection

of social media data taken from the business intranet social network **(Hansen et al., 2011; Matei, 2011, 2011; PEW RESEARCH CENTER, 2013; Smith et al., 2009**).

7. Discussion

NodeXL is supposed to streamline the system information analysis process, making it less difficult to turn edge documents and rating systems into proper descriptions that speed up disclosure. The use of networks as a graph supported by a database eliminates barriers to the inquiry and security of network information. Because machine representations are usually not readily intelligible, more straightforward diagrams outlining a subset of system characteristics may be required in the investigation. The use of the spreadsheet to house system information does not address a large number of other long-standing difficulties faced by the net-work review when all is said to be completed and unit awareness directly(**Matei, 2011**). Device expectations can become inaccurate or move on limited data without much of a break. Edge and bridge distortion restricts the number of hubs and edges that can be easily seen. Design calculations often fail to explore optimal game plans with lines and centers, keeping in mind the overall goal of expanding the understanding of the system's structure. Groups of hubs are hard to distinguish and speak to, particularly when the seat is involved in more than one batch. Vast scale information sets are hard to show**(Hansen et al., 2011**). NodeXL did not directly answer these and many other problematic issues in model design and system perception.

To individuals who can write, the spreadsheet offers a rich and broad programming dialect. To individuals who do not write, making a spreadsheet template may be more possible, while the information control approach is still extreme. NodeXL reveals that a very high level of adaptability can be accomplished with just a few spreadsheet formulas. Extricating "good" links is a contrasting method to cutting Network by time. Clients can restrict many-sided quality by obliging the most rooted relations in the systemdelivery of the investigation. NodeXL photos structured for printing are more constrained than to intelligently analyze the system structure in the NodeXL design diagram perception layer(**Holmberg & Hellsten, 2015**).

8. Conclusion

Nodexl is required to detangle the protocol of the machine information examination, making it easier to turn over edge records and frequency network structures are essential in many orders and calls. Enthusiasm for these systems is growing more radically, as the world of interpersonal organizations and the pc-interposed social content turns out to be more familiar. NodeXL intends to examine and portray system information less challenging by integrating the usual inquiry and interpretation capacities with the well-known spreadsheet paradigm for the information it takes care of. The device empowers fundamental system audit tasks and therefore enhances a large group of clients ' audiences in an expansive range of system review circumstances. Using the device as an indicator of the online networking system dataset, we identified and explained basic examples such as the width of the connections within the undertaking, different types of patrons, and critical system measurements. Such examination criteria can be easily linked to a wide range of online networking information sets.

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