

## Evaluating the influential factors on virtual social network's users in viral marketing

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### Abstract

These days, by attending to the ever-increasing development of social networks and fast development of the virtual relationship with millions of message interaction possibility in a second by these powerful beds, social networks analyses have been attended by analyzers and experts in different areas, especially in business and marketing fields. Companies and producers, because of marketing development in this part, and service presenters through the world believe that goods advertisement is vital in sailing success and presenting the services and company's profitability. Naturally, the last, past and traditional methods are not suitable. so, the online social networks transfer their advertisements to the customers in different parts of the world with low cost and fast spreading. Therefore, knowing the effective nodes in fast and low-cost spreading and effective recommendations for companies changed to a great challenge by attending to the giant structure of these networks. In this article, the factors, which are over the effective advertisement and services, have been extracted and the needed data have been gathered from Facebook virtual network users (437samples).

The gathered data were analyzed in before stages by SPSS software. The stability of the questioners was verified by Cronbach's Alfa coefficient, and finally the suitable results and approaches were presented about recognizing the effective factors in social networks and their impacts scale on social network users which can be effective in viruses marketing area for increasing the business companies' advertisement spreading for reducing the costs of advertisement and comprehension of the advertisement.

**Keywords:** Viral Marketing, Social network, Social Network Analysis, Influential factors.

### Introduction

Recently, the competition for accessing the customer and changing them to potential customers is one of the important challenges of companies. In base of this, they have looked for new services and motivated factors in spreading the advertisements and attracting the customers. For reaching to this goal, the companies need to use the suitable marketing approaches. This need especially recently, which the traditional methods don't have impact (E. K. Clemons,2009) and on the other hand customers trust to the received recommendations from friends, folks and other customers (Y. Chen and J. Xie, 2008) cause that the companies looked for approaches which make them able to answer to these needs.

In base of this, by appearance of web2 and changing the web cooperative structure which was accepted and presented in a marketing approach like viruses marketing which present utilizing from people believes and recommendations thought (J. Yang, C. Yao, W. Ma, and G. Chen, 2010).

The virus marketing uses the users for news and advertisements free spreading to show the company for everybody. In this approach it is possible to increase the company's advertisement by encouraging the customers to introduce the company to their friends and folks. In base of this, the social networks beds are the suitable environment for advertising viruses (J. Goldenberg, S. Han, D. Lehmann, and J. Hong, 2009). In addition to the wide volume of the customers of these networks, it is possible to point to the possibility of observing the users' interactions, observing their characteristics and tracking the spread concept (P. Schmitt, B. Skiera, and C. Van den Bulte, 2011).

So, in this article we explore some influential factors and their impact on people analytically. The results of this article can help the analyzers and experts who work in analytical areas of social network and need to recognize the influential volume of these people in influential factors in these networks.

#### ***The goal and research question***

The researches and studies show that there are some vacuums in networks in virus marketing area in virtual social networks, especially knowing the parameters and influential factors in these networks. Our goal in this article is to find the factors and analyze the volume of impacts on selecting the goods or products by present people in social networks by using the past experiences and the researches which were done in different articles and also by library studies in a research frame in the virtual social network (sample is Facebook) and also doing the statistical analyses and using the suitable approaches.

#### ***Research questions and research hypotheses***

1- It is considered that the users of the social networks attend to their friends' recommendations in selecting a production.

2- It is considered that the users of social networks attend to the people with high degree in selecting a production.

3- It is considered that the users of the social networks don't attend to the statistics of users in social networks.

4- Can the social networks cause to increase speed and reduce the costs of the advertisements for the business and advertisement companies?

5- Can the present influential people be used effectively as the influential missionaries by business and advertising companies?

6- Which effective factors can be mentioned in the social networks which impact on the users?

#### **Methodology**

The present research method is "descriptive" and "documentary analytical" which has gathered by referring to the articles and theoretical bases of the theorists in relation to the social network indexes and structural and conceptual factors of these networks. The data gathering tools are: studying the new articles about this area, existent documents and proofs and the related websites. Two methods were used for evaluating each of the indexes in the environment. The first approach includes the evaluation of the consultancy observation and the second one is the evaluation in base of result-centered indexes. The approaches in base of the consultancy observation are techniques in base of reality and the result-centered approaches are used for evaluating the environment's mental criteria, which by assessing the social networks' users from people's impact on them for evaluating the people's impact scale, a questioner was distributed among social networks and about 437 users filled the questioner and in this questioner 10 questions were designed according to the standard. The quantity analyses of data were done by statistical methods by SPSS and Excel tools. The base of valuing was done according to the Likert spectrum. The degree

reducing and studying conceptual methods are explored after exploring the stability and validity of the questioner and gathering the data by SQL Server by the combined algorithm.

### **Theoretical bases**

#### ***Literature review***

A social network includes the collection of services which include the web and supplies this possibility which creates public and private descriptions, interact with other members of the network, share their sources with them and seek for finding the new connections from other public descriptions (M. Donah et al, 2008). In base of other definition, a social network is a social structure which is made from personal and organizational nodes which connected to each other by one or some dependence (<http://fa.Wikipedia>). These dependences can include the folk, business interactions and other interactions. From 1997 to 2001 some social tools tried to space for gathering the people and creating a connection among them. In 2001 the first social networks was created with business goal in the name of Riser, and so the different social networks with different goals and different figures which the important ones include Facebook, Overcut and My Space. By attending to definitions and mentioned literature review for social networks, it is possible to find that receiving what separates social networks from other internet spaces is the existent social possibilities in these networks for creating a connection between people.

On the other hand, people in these networks can have a social behavior, introduce themselves in summary, create a connection with together, send a message to each other or virtual gifts, use other people's shared things or leave a message about them. On the other hand, while the social networks give different possibilities to people, but the main goal and their main reason is to create a connection between people. And so, it can be said that presenting a method for increasing the connections will be suitable.

#### ***The social networks' details***

##### ***Profile***

A collection of information which a person has recorded in social network about himself or herself with a collection of items which loaded is called profile. On the other hand, every user's profile is the unique pages which the user mentions his or her interesting and existence (M. Donah et al, 2008).

##### ***Friends***

Friends of a user in a social network are the reliable people whom the user selects from social network and create a relation with. The friends can see each other's information and give an ideal about others' ideas and see the shared thing like film, pictures and music. It should be attended that the concept of friendship in social network is different from its common meaning, and the friendship in social networks is created with different goals and methods (D. Boyd, 2007).

##### ***Groups***

Most of the social networks use the groups for identifying the people with same interests or supplying the suitable bed for discussing with people about a special topic. A group may be a group of students of a class or group of people who interest to a special book (D. Boyd, 2007).

##### ***Discussion***

Most of the social networks use the discussions for creating an interaction between people. In these discussions, people can mention their ideas about different topics and aware about other's ideas. In addition to this, people can send their ideas by special services about the shared items which left by other users and also their profiles.

*Some characteristics of social networks*

Different characteristics and criteria in different articles have been presented about social networks. In this part some characteristics will be studied which these items are countable for all social networks:

*General utilization*

This criterion assesses the function of data connection between network's nodes and is defined as below:

$$\text{Formula 1 : } E = \frac{1}{N(N-1)} \sum_{i \neq j} \frac{1}{d_{ij}}$$

In this relationship  $N$  shows the number of network's nodes and  $d_{ij}$  shows the distance between two nodes. The distance between two nodes can be defined with weight. For without weight position, the distance between two nodes is the existent wings in shortest distance among them, while in with weight position it is possible to count the weight in distance counting. Distance in with weight position is the sum of wings' reversed weight in shortest distance between two nodes (Timothy C. Matisziw, 2008).

*Network vulnerability*

Vulnerability is the detail of characteristics which defined for each head. The vulnerability of one head equals with reduction of function which its omission, the heads and wings are created. The vulnerability of one head is defined as below:

$$\text{Formula 2: } V_i = \frac{E - E_i}{E}$$

In this formula  $E$  shows the general function of network after omitting the node  $i$  and its wings. The vulnerability of network equals with most vulnerability of its head (Timothy C. Matisziw, 2008).

$$\text{Formula 3: } V = \max_i V$$

*With weight and without weight's clustering coefficient*

We have two clustering coefficients. One of them is defined for without weight and without side networks which is called Transitivity. This criterion is accessed as below:

$$\text{Formula 4: } C = \frac{3N_{\Delta}}{N_3}$$

Thus in formula 4,  $N_{\Delta}$  is the number of triangles of network and  $N_3$  shows the three-matches connected to network. This criterion is defined for with weight and with side networks, which each presented criterion should be counted (P. Bonacich, P. Lloyd, 2001).

*Coiled coefficient*

The local coiled coefficient of node  $i$  equals with the reversed mean of the smallest size of rounds made from  $i$  node and its neighbors which denied as below:

$$\text{Formula 5: } \theta_i = \frac{2}{k_i(k_i - 1)} \sum_{(j,k)} \frac{1}{S_{ijk}} a_{ij} a_{ik}$$

In this relationship  $k_i$  equals with the number of the neighbors of node  $i$ ,  $a_{ij}$  shows an element from network's nodes' neighborhood and  $S_{ijk}$  shows the smallest round's size which passes from nodes  $i, j, k$ . if the nodes  $j$  and  $k$  connect to each other, a triangle will be made and  $S_{ijk}$  will equal 3. And if no round find in the network which passes from these three nodes, so the  $S_{ijk=\infty}$  will be accessed. The coiled coefficient of the total network is as follow:

$$\text{Formula 6: } \theta = \frac{1}{N} \sum_i \theta_i$$

### ***The influential people and virus business***

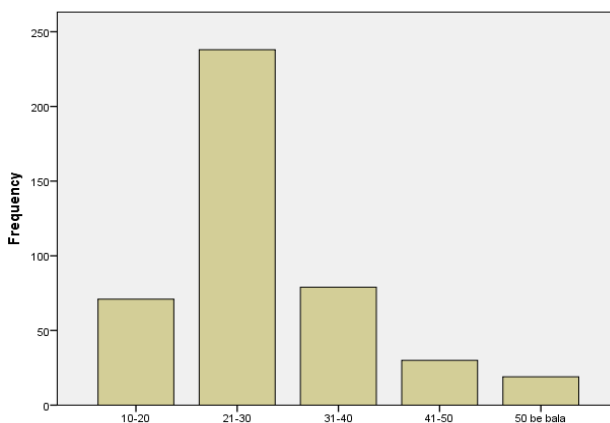
Recognizing the influential people and spreading the impact which resulted from using them as a primary core of virus business for the first time were studied by Richardson and Domingo in (M. Richardson and P. Domingos, 2002 and 2005). They pointed to this problem that a customer's worth depends not only on past buyers but also to the impact which they have on other buyers. Therefore, they defined two concepts for each customer. The first concept is the network volume and the second is the network impact. These two concepts' difference is specified by each node's network volume and the profit that accessed from activating that node. But the network impact mentions the volume of the impact of one node on network's nodes. They solved the problem by optimizing the profit dependent which accessed from profit's difference which resulted from using business marketing and no use of marketing strategies. In these article we did not attend to the selecting the collection of people as the primary core, the process impact on neighbors quality and the distribution process quality.

### **Results**

In this part of the article, the data gathering method will be studied and then we will pay to analyze the data and analyzing the research question and research hypotheses.

#### ***Gathering the data and analyzing the personal factors***

In this research the questioner was used for gathering the data by the web. The characteristics of questioner will be as follow by using the standards, The spread questioner was in base of Likert method. Since in researches which are measurement. For evaluating and doing the research this method is so suitable. The ordinal variables of the research are: questions, qualification and ordinal questioner variables and we changed them to quantity data to analyze it easily. In this research we used SPSS software for comparing the research questions and research hypotheses. The primary results were as this that most of the people of the population were young people and about 238 people (54.5 %) of this population was between 21-30 ages (Diagram 1).



**Diagram 1: The age diagram of people**

In base of research data most of the people (237 people and 54.5%) are male (Table1) which we conclude that most of the people are active in these social networks are male mostly and minimum females are active in these networks, and also in base of data analyses and the research tables about 393 people and 67 % of the population were single and less percentage of them were married.

**Table 1. The distribution and the sexual percentage of studying people**

	Frequency	Percent	Excluding data(percent)	missing	Cumulative frequency
Man	237	54.2	54.5		54.5
Woman	198	45.3	45.5		100
sum	435	99.5	100.0		-
Missing data	2	0.5	-		-
Total	437	100	-		-

Also, the data accessed from research analyses show that about 228 people and 52.2 % of these people were occupied and less percentage of them were unemployed, and also about 45.3% of them were Bachelor and less percentage of them were Diploma and Under Diploma, which in base of accessed results from analyses it can be found that most of the people who cooperate in social networks were young, male, single and bachelor and occupied, which these characteristics can affect the result of study and investigation (Table 2).

**Table2: Distribution and the percentage of studying people's education**

	Frequency	Percent	Excluding data(percent)	missing	Cumulative frequency
The Diploma	54	12.4	12.5		12.5
Diploma	63	14.4	14.6		27.1
Associate Degree	58	13.3	13.4		40.5
Bachelor	197	45.1	45.6		86.1
Masters or higher	60	13.7	13.9		100.0
sum	432	98.9	100.0		-
Missing Value	5	1.1	-		-
Total	437	100.0	-		-

The results accessed from questions which specialized to goods advertisement in questioner are as follow; that is, most of the population attend less to select a production because of their friends' recommendation and the impact of this factor was not more in their point of view and 45.3% of these people knew it "somehow" influential, and also 44.4% of these people knew influential the "benevolent people recommendation" and about 53.8% of them knew the "homogenous people's recommendations" influential in selecting a production which in base of this the studying population know it influential but they mentioned its impact "somehow" and they did not mention it important. And also these people about 31.1% knew the "recommendation of people with high scientific degree" influential in selecting a production and knew it "somehow" important and influential; and also in base of research data, these people knew about 40.3% of the factors of "the number of users" influential for selecting a production "much" effective, and this factor can attend the population's consideration for selecting a production.

***The results accessed from hypothesis***

In this part we pay attention to the results of analyses.

***The accessed results of first hypotheses***

It is considered that the users of social networks in selecting a production attend to their friends' recommendation.

The accessed results of the data in table (table 3) and figures related to analyzing this part in relation to the related hypotheses shows that the most distribution with 198 and 45.3% related to "somehow" option, and the less distribution is related "never" option with 13 and 3%. Also by attending to the mean 2.5011 and standard deviation 0.91025 and length 0.261 and deviation 0.217 which shows the standardization of data, it can be said that the impact of friend's recommendation in selecting a production was influential somehow and it can be the important factor in selecting a production. But the impact of friends' recommendation in 31.8% of the population could be the reason of accepting this hypothesis.

**Table 3 : The analytical results of hypothesis**

	Frequency	Percent	Excluding missing data(percent)	Cumulative frequency	Number	437
					Mean	2.3616
Very much	64	14.6	14.6	14.6	Missing value	0.0
High	139	31.8	31.8	46.5	Standard D.	0.91025
To some extent	198	45.3	45.3	91.8	Skewness	0.217
Very little	23	5.3	5.3	97.0	Kurtosis	0.216
Never	13	3.0	3.0	100.0	Minimum	1.0
Total	437	100.0	100.0	-	Maximum	5.0

***The accessed results of second hypothesis***

It is considered that the users of social networks pay attend to the people with high-degree of education in selecting a production).

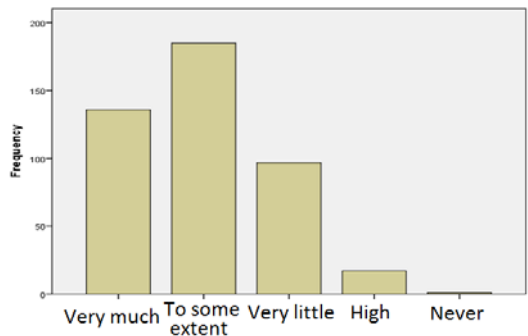
By attending to the results of data analyses and diagram (figure 2), most percentage of distribution with 136 and 31.1% is related to "much more" option and the less distribution with 1% and 2% is related to "never" option, which shows the population's trust is for people who have the high-degree education, and so they can be the better leader for leading them in selecting production. And this trust, by attending to the above mentioned data with high mean of people with 1.9954 volumes and 0.84417 standard deviation and deviation 0.492 and -0.321 length, shows the deviation to right hand of data. And it shows the high volume of the people with high-degree of education, and the people in the society pay more attention to this class's recommendation more than the other classes; therefore, the research hypothesis is accepted.

***The accessed results of the third hypothesis***

It is considered that the users of social network don't attend to the users' statistics in social networks.

Analyzing the data accessed from table 4 shows that the much distribution with 176 and 40.3% is related to "much" option and the less distribution with 9 and 1.2% is related to "never" option. And by attending to the mean 2.3616 and standard deviation 0.94816 and length -0.107 and deviation 0.434 which shows the deviation to right hand, so it can be said that the studying society

attended to the number of users and this item is influential in selecting a production. While 30.4% of people knew this factor as the influential factor, but this factor can attract more theorists' ideas to itself and attend to it in selecting a production. Therefore, the hypothesis is rejected and this factor is defined as the influential factor.



**Diagram 2: The diagram of the information of the second hypothesis's data**

**Table 4 : The analytical results of the hypothesis 3**

	Frequency	Percent	Excluding missing data(percent)	Cumulative frequency	Number	437
					mean	2.3616
Very much	80	18.3	18.3	18.3	Missing value	0
High	176	40.3	40.3	58.6	Standard D.	0.94926
To some extent	133	30.4	30.4	89.0	Skewness	0.434
Very little	39	8.9	8.9	97.9	Kurtosis	-.107
Never	9	2.1	2.1	100.0	Minimum	1.0
Total	437	100.0	100.0	-	Maximum	5.0

### Conclusion

What had been expected in this article was to extract the factors which could be effective in impacting volume in virus business area, therefore in this article, different factors like friend's recommendations, the high-degree people's recommendations and the statistics of users were studied and analyzed as the influential factors in social network. This activity was studied and analyzed in Facebook social network and by users' ideas as experimental study.

These factors were analyzed in impacting on users for buying and supplying the goods and accepting advertisements in social network (the 5<sup>th</sup> part of this article). These factors were studied in two structural and conceptual factors which the friends as the structural influential factors and people with high-degree of education as the conceptual parameters were mentioned. By attending to the accessed results from analyzing the data, it can be said that attention to mentioned factors in social network analyses can be important; so, attention to the factors in structural methods and conceptual methods and also combined methods can be influential in presenting the different algorithms. Therefore, it can be said that these factors can be considered as the important and considerable factors and can be used in different applications either in analyzing or landing the different methods of sending advertisements.



By attending to the extracted results from this article and by analyzing the personal characteristics of users in these networks and also the analytical results of other parts which are related to questions and hypotheses accessed from this study, it can be concluded that attention to the presented influential factors like friends, people with high-degree of education and the statistics of users for assigning the people through these factors can be so important, so that the business companies can help to increase the advertisement spread and speed of advertisement instead of using the old and traditional methods in advertisement. Using these factors in this article causes to increase the impact in advertisement and the virtual social network users' influentially. So, using the results can be important in problems which are related to the effective advertisement in virtual social networks, and it can be the basis for increasing the sailing and reducing the enormous costs of the business and advertisement companies.

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