ANALYZING SOCIAL NETWORKS FROM THE PERSPECTIVE OF MARKETING DECISIONS

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***Abstract**: Nowadays, the Web became more than a space for product presentation, but also a capitalization market (e-commerce) and an efficient way to know the customer preferences and to meet their requirements.*
Large companies have the financial potential to use various marketing strategies and, in particular, digital-marketing. Instead, small businesses are looking for lower cost or no cost methods (also called guerrilla marketing).
A small company can compete with a large company by approaching a particular range of products that excel in quality, and also by inventiveness in the marketing strategy.
During 2010-2015 the potential of Information Technology and Communications (IT&C) sector was proved for the companies which aimed towards modernization of technologies and introduced new strategies in order to commercialize new products. An important challenge for companies was to be aware of the changes in customer behaviour, using social networks software. Finally, research centers have set up new IT&C services and improved marketing and communications following the crisis. More and more companies invest in analytic tools to monitor their marketing strategies and Big Data becomes extremely useful for this purpose, using information like customer demographics and spending habits, oscillation between simplicity, comfort and glamour. There are various tools that can transform in a very short time, massive amounts of data into real business value in a very short time, helping companies and retailers to understand, at any point in the product lifecycle, which trends are gaining and which are losing ground. These insights give them the possibility to reduce the risk of not selling their products by making adjustments to the design, production or promotional strategies, before putting the goods on the market.
In this paper we aim to present the advantages of exploring customer requirements from social media for marketing strategy of an enterprise, by using SNA software Gephi and NodeXL and making a comparison of their features.

***Key words**:* digital marketing, social network analysis software, Big Data

JEL Classification Codes: M31, C80, C88.

1. INTRODUCTION

Nowadays, the market competition has increased as a result of the crisis, firstly, and secondly, as a consequence of the reduction of the gap between SMEs (small and medium enterprises) and large companies, since the development of virtual market and Internet services removed the barriers in business.
While large companies must keep their notoriety, customer loyalty and develop a trusted brand, SMEs prefer inventiveness, originality, and all methods that can "destroy" the traditionalism in every area of marketing. They are trying to create a brand, a portfolio of known products and a growing customer base, and go upon the "all or nothing" strategy.

Obviously a company's marketing activity has a decisive role in its success on the physical and virtual market, in promoting and selling a new product launched, in outsmarting the competition. According to the authors of this paper, this activity should not be performed intermittently, but constantly. A continuous and high quality communication flow creates a type of loyal connection with the consumers of the goods and services offered by the concerned company. Also, a successful ad can change the perception of a market segment concerning a brand (brand awareness) and improve the customer base.

The visibility on Web 2.0, online sales and advertising by all Internet channels (dedicated sites, Google AdWords, emails) have become the main methods to reach the market and to expand a business. In addition, the new way to "listen" to the opinions, comments and requests on social networks is added, as they are more relevant and sincere than surveys. It is a huge volume of information, apparently useless, but that can contribute to decision-making, after being processed.

The paper aims at discussing these aspects, precisely to use Big Data for collecting and processing Social Media information, and to explore it using Social Network Analysis (SNA) software in order to look for explanations about the desires and opinions of clients.

Our work is divided into four sections and a Conclusions part. Section 2, Literature review, presents the advantages of digital marketing tools in comparison with the traditional methods, and also the two concepts involved (Big Data and Social Network Analysis) in online marketing, summarizing some of the background material.

Section 3, Methodology, includes a brief analysis of the Big Data technologies and SNA software, especially Node XL and Gephi tools.

Section 4 refers to an experimental study concerning the analysis of the same network by using different software applications, underlying the advantages and drawbacks of each method, and discussions related to the results for enterprise marketing strategy.

Conclusions close the paper, and suggest ways of improvement of digital marketing technologies, the increase of adoption ratio for the Big Data and SNA free platforms in recent future.

2. LITERATURE REVIEW

2.1 From traditional marketing to digital marketing

In recent years, every company must implement marketing strategies to attract customers, create a brand image and remain competitive in the market. In this regard, the marketing tools vary from traditional media to the high-tech options such as web-based interactive strategies and email marketing (Frederiksen, 2014). Lately, a multitude of new media and marketing tactics have appeared, but not all folds effectively to any type of business.

According to the American Marketing Association board, marketing is the activity, set of institutions and processes used to create, communicate, provide and exchange of offers that have value for customers, partners and society in general (Armstrong, 2015).

In the sense of Philip Kotler, marketing is viewed as a social and managerial process by which individuals and groups of individuals get what they need and what they want through creating, offering and exchanging products, possessing a certain value (Kotler, 2000).

In summary, marketing shapes in the "business function that identifies unfulfilled needs and desires, defines and measures their magnitude and potential profitability, determines which target markets organization can serve best, decides on products, services and programs chosen appropriate to serve these markets and asks everyone in the organization to think and serve the customer." (Kotler, 2003)

Traditional marketing tactics revolve around the "4Ps" of marketing: Price, Product, Placing, and Promotion. Among the traditional marketing channels most commonly used, we distinguish

the following: printed ads (newspapers, magazines, posters), commercials (radio, TV) and printed promotional materials (catalogs, direct advertising letters, notebooks and calendars).

In the fast pace in which companies operate currently, traditional marketing strategies are no longer as effective as before. Although traditional media marketing still represents 50% of total advertising investment, they are considered in decline, with polls showing that 70% of respondents are not interested in TV commercials (Ahlberg & Einarsson, 2008).

We can say without fear of being mistaken, that today, businesses are facing a well-informed audience that is becoming more familiar with marketing, and, therefore having high expectations from advertising campaigns, requiring companies to constantly adapt and identify the optimal media and marketing strategies.

Internet Marketing (online marketing or digital marketing) can be viewed as the result of a meeting between modern means of communication and consecrated marketing principles. The term can be defined as the marketing of a product or service through the Internet, including both elements of direct marketing and elements of indirect marketing, using a variety of technologies to help companies connect with target customers and to develop brand identity. It adds another three tactics to the traditional marketing tactics, namely: People, Process, and Performance. (Quirk e-marketing, 2006).

At this point, we must emphasize the difference between marketing and advertising. Marketing refers to the systematic planning, implementation and control of a mix of business activities intended to bring together buyers and sellers for the mutually advantageous exchange or transfer of products. Advertising is a component of the marketing process and it means **t**he paid, public, non-personal announcement of a message, a presentation or promotion by a firm of its products to its existing and potential customers (Lake, 2015). It involves the process of developing strategies such as ad placement, frequency, etc. Internet advertising includes the placement of an ad medium as direct mail, websites, news etc.

Small firms resort to guerrilla marketing strategies to promote their products or services with a low budget and the most known method is viral marketing.

We can consider that the Internet marketing domain can be classified in two major areas: the advertising, which conveys the information from the company to the potential customers, and the feedback mechanisms, which relay the customer opinions (feelings and impressions) back to the company.

The advertising could be realized by using websites, web banners, pop-ups, pay-per-click, e-mails, viral marketing, while the opinions of clients are more difficult to be known because of their spreading on Social networks (Facebook, Twitter, LinkedIn), YouTube, blogs and polls.

A study by the Content Marketing Institute shows that Social Media is the most popular way to publish advertising content, 92% of marketers surveyed saying they use this tactic, as we can see in figure 1 (Pulizzi, 2014). The next two top positions are occupied by newsletters sent via e-mail (83%) and articles on their own websites (81%).

Global statistics from recent years show that investments in traditional marketing methods fell by almost 160%, while online marketing expenses increased by over 14% (Kirpekar, 2015).

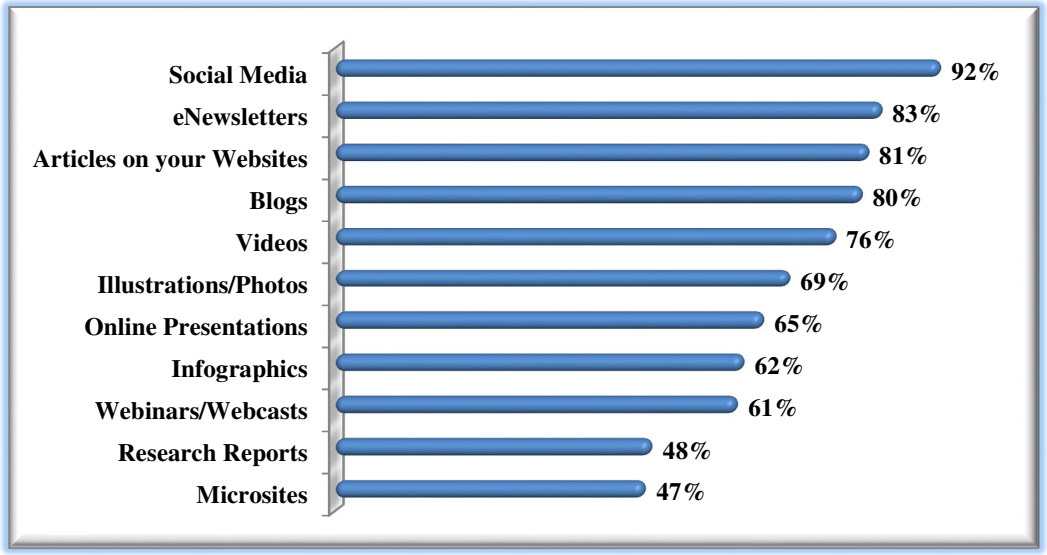

Figure 1. On-line distribution channels of the marketing content (Source: Pulizzi, 2014)

We present in brief some of the advantages of modern marketing tools:

- *Addressability* - digital marketing tools are designed to target specific customer segments.
- *Profitability* - does not involve investment efforts as large as those carried out over time in traditional marketing. Online marketing channels require low cost campaigns, e-mail marketing campaigns, business blogs, Facebook pages and websites of companies often start with options like "zero cost", making them a viable alternative to traditional marketing, especially for small businesses with limited marketing budgets (Frederiksen, 2014).
- *The speed of propagation* - online marketing acts almost instant, even if the content and design takes time, marketing campaigns can be implemented with a single click of the mouse *(*McQuerrey, 2014).
- *Providing global coverage* - the Internet and Web-based services, e-mail, performing search engines, the success of social networks provides businesses online presence regardless of geographical area (Frederiksen, 2014).
- *Measuring results* - is done in real time using methods of counting the number of visitors to sites, lists of online orders, comments of those interested etc. In order to measure the impact of marketing campaigns and the customer interest for their online presence, companies can use tools like Google Analytics, which reveal how many visitors are accessing their web pages, where they come from, how many read the tracked advertising emails, and thus how popular their products become over time (Chaffey, D., 2015). Each click or visit on a webpage or website, each sign-up and online purchase can be measured with extreme precision, enabling marketers to easily evaluate which of the tools of online marketing best fits their requirements and bring best results, while at the same time, offering the possibility of a better understanding of purchasing behavior of their target customers (Sutton, 2012).
- *Improvement of the customer - provider communication* - the ability to interact with target customers in real time can help build better customer–provider relations, thus leading to obtaining a higher level of confidence and a customer loyalty with benefits on both sides.
- *Quicker penetration of small and medium companies* - in online media the differences between large companies and SMEs fade, resources for promoting and selling a product with comparable characteristics in both types of companies is no longer an impediment; a modest company with a well-organized site that provides optimal navigation and good services can compete and win the competition with a producer owning a chain of stores (Sutton, 2012).

There are a number of drawbacks and limitations that come bundled with modern marketing tools (Divol et al., 2012), namely:

- *Possibility of copying and counterfeiting campaigns on the Internet* – the pages of a website, trademarks or logos may be copied and reproduced on pirate sites and used to defraud customers and bring financial and moral damage to the source company.
- *Internet has become overcrowded with advertisements* and pages are full of irrelevant inserts that distract the reader and slow down the page loading speed, thus leading to a point where users tend to ignore all ads (even use ad-blocking software), and where the businesses that are promoted this way start to lose profit.
- *Internet averse* - there are also reluctant people for two reasons: prefer to choose products from stores because certain features cannot be transmitted online or do not trust virtual presentations, and most are concerned about the security of online transactions.

2.2 Using Social Media for marketing

This work aims to present the benefits for marketing obtained by exploring the Social Media, using two IT technologies: Big Data and Social Network Analysis (SNA) software.

Looked from a favourable angle, Social Media has become a huge forum, where ordinary persons are saying honestly their opinions, are trying to find new ways to solve problems, learning new things and transmitting in their turn.

"Listening" the Social Media, the firms, no matter the domain of activity or their size or their previously evolution, could promote in a faster pace their products or services and could gain immediate feedback by analyzing blog comments and social networking conversations (Stelzner, 2014).

Marketing through Social Media is the way to promote a site, a brand or business by interacting with current or potential customers or attract their interest, using social networks, blogs etc. With a growing number of daily users of social networking sites are attracting more and more customers and enable widespread view of many promotions, all these turning social media into a platform for optimal marketing activities (Saravanakumar, 2012).

According to a study realized by Social Media Examiner in 2014, an overwhelming majority of respondents (97%) are in Social Media, 92% of them considering it as very important to their business, while 83% of respondents admitted that they have succeeded in blending the Internet channels in their general advertising policy. Social platforms used by marketers extensively to promote their brands and products are: Facebook, Twitter, LinkedIn, YouTube, Blogging, Google+ and Pinterest (Stelzner, 2014) – figure 2.

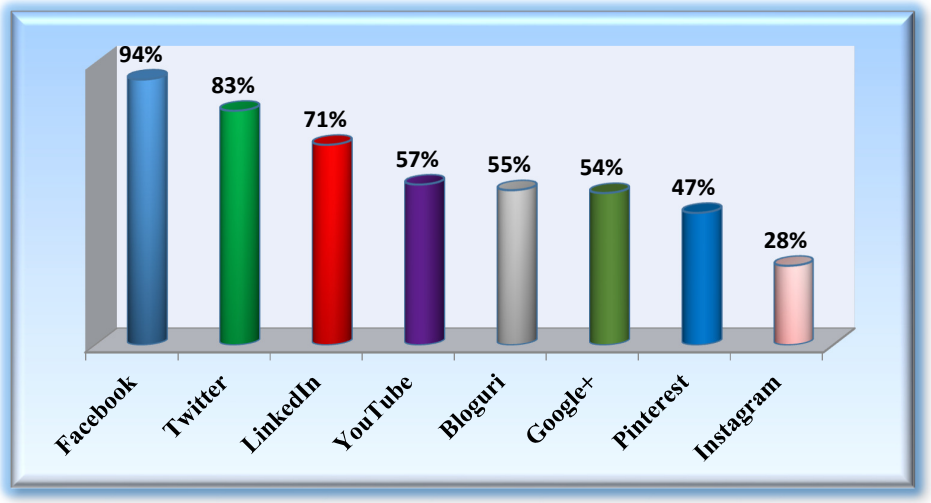

Figure 2. Using the social platforms (Source: Stelzner, 2014)

Further, the study focuses on the second component of Internet marketing, the "feedback" side, consisting in gathering and processing the information of social networks, blogs, e-mails, websites. This component involves specific software tools for collecting and processing of huge volume of unstructured data and analytical applications to explore the query results.

2.3 Exploring Big Data with SNA software in marketing domain

The sheer amount of data created by the digitized world conducted to the Big Data concept, which includes both structured and unstructured data. Business environment is firstly interested in developing tools to allow exploration of this large volume of information, in order to find sincere answers to important questions about the production, sales and marketing. A solution to build a Big Data infrastructure for a company is Cloud Computing environment, offering the resources required to store and access data volumes.

These two advanced IT technologies enable companies to efficiently harness the information from Social Media by synthesizing, analyzing and correlation, in order to turn it into a source of business advantage (Adduci et al., 2012).

There are many free software programs, used for Big Data analytics created by the Apache Software Foundation, Google and Yahoo.

Section 3, Methodology, will briefly present Hadoop, an open-source technology that distributes the data across multiple computers (nodes) to be processed faster and two applications from SNA software category: Gephi and NodeXL.

2.3.1 Big Data concept

Big data is not a precise term, generally it describes datasets that are growing exponentially and that are structured and unstructured. An important volume of unstructured data is generated by social networks, server logs, sensors, and mobile networks.

"Big Data may be as important to business – and society – as the Internet has become. Why? More data may lead to more accurate analyses." (Davenport & Dyché, 2013)

Also, we must specify that this term refers to all embedded software tools, intended to capture, process and analyze large datasets and known as "Big Data technologies".

The main characteristics of Big Data are described by experts through the five V's as follow (Bowden, 2014) (Dijcks, 2013):

- **Volume** – refers to the scalability as the most important aspect for every domain of application. The data volume build-up may be from unstructured sources like the social media and from traditional databases. The relevance of the volume of data collected may be obtained by filtering using analytic tools in order to identify important patterns and metrics that are found in business field.
- **Velocity** – the increasing flows of data need hardware and software solutions to process data streaming in a paced as fast as possible; the actors of the market need answers to their questions in real time.
- **Variety** – concerns the combination of all types of formats and the differing meanings attached to the same forms, Big Data must cover every opportunity of connecting the business with the customers in a virtual marketplace.
- **Veracity** - refers to the trustworthiness of the information; the data may be not significant, also there could be discrepancies in the sample of data collected, filtered and processed.
- Value **–** is the most important V of Big Data because it turns the increased amount of data into commercial or scientific value. The final target of processing Big Data is to develop the business, to obtain a stronger competitive position and a high level of knowledge, to find new solutions in all areas (economic, social, health and education).

Business is interested in gathering information from non-conventional sources of data to analyze and extract meaningful insight from this maze of data, to know and forecast, at the same time, the consumer behaviour.
The companies do not intend to completely replace their traditional data sources (reports, survey results, statistics), but to extend them with the new insights coming from Social Media data processing (Banica and Hagiu, 2015).

2.3.2 Social Network Analysis

The proliferation of data is endless, humanity tends towards building nearly infinite databases. Business data volume of an enterprise tends to move from terabytes to petabytes and social media provides two or three times more data. In these conditions, business and IT domains face problems of storage and processing resources, but also have the opportunities to gain a competitive advantage.

Companies that align their processes, operations and corporate culture to exploit big data will gain benefits after short time (Adduci et al., 2012). According to International Data Corporation, IDC's 2014 report, the amount of information created and replicated in 2013 was 4.4 zettabytes, 2.9 being created by consumers, but enterprises are responsible for 85% of this (Turner, 2014).

The impressive success of Social Media platforms, such as Twitter, Facebook, Flickr, YouTube, and Wikipedia changed the communication ways, the actors and their social roles on the Internet. In this context many researchers have developed software tools for social network analysis and visualization.

There are many definitions of Social network analysis (SNA) but we consider that the most relevant was given by Otte and Rousseau, in 2002: "SNA is a strategy for investigating social structures through the use of network and graph theories. It characterizes networked structures in terms of *nodes* (individual actors, people, or things within the network) and the *ties* or *edges* (relationships or interactions) that connect them." (Otte and Rousseau, 2002)

The International Institute for Sustainable Development, in a Report published on 2012, mentioned that „Social network analysis software is used to identify, represent, analyze, visualize, or simulate nodes (e.g. agents, organizations, or knowledge) and edges (relationships) from various types of input data (relational and non-relational), including mathematical models of social networks." (Ryan & Creech, 2012)

A SNA software generates the graphical representation of the network and metrics, identifies subgroups in a network, clusters of actors or individuals, or emphasizes isolated nodes of the network (Krebs, 2013). Some commonly used measures are centrality, which refers to the importance of a node into the network and the hierarchy of the entire network and network density, useful for assessing the overall relationships within a network.
Two of the most popular SNA software packages are: NodeXL and Gephi and their characteristics will be described in Methodology section.

3. METHODOLOGY

In this section we aim to present the new type of database - NoSQL, used for storing Big Data, and two SNA software applications, commonly used on the market today.

We must emphasize that any implementation of Cloud Computing environment could offer a high-capacity storage solution for Big Data platforms.

Concerning the hardware and software infrastructure for Big Data, Cloud computing is the best solution available on the market for small and medium enterprises, due to the price-performance ratio.

NoSQL databases are a new type of database that manages the unstructured data using four models (Mohamed et al., 2014):

- Key-value store (KVS) – for designing databases where each record has attached a unique key in order to allow the access to the record's information, represented as value.
- Document – for managing data from documents in different format standards, such as XML or JSON. It is a complex category of storage that enables data querying.
- Column – refers to a database structure similar to the standard relational databases, data being stored as sets of columns and rows. Columns that store related data that is often retrieved together may be grouped.
- Graph - for designing the structures where data may be represented as a graph with interlinked elements. In this category social networking and maps are the main applications.

Hadoop is an open source software platform that allows parallel computing of large volumes of data. This processing tool distributes data across a cluster of balanced machines working in parallel and thus, moving the processing in proximity to the location where data is stored, reducing network transfers (*Yahoo* Developer Network, Hadoop Tutorial, 2007).

The open source Apache Hadoop distribution includes two core components (Lo, 2014):

- Hadoop Distributed File System (HDFS) - the storage component which splits data files into subsets of records, managed by different nodes in the cluster;
- MapReduce engine - the processing component which Hadoop uses to distribute work around a cluster, so that operations can be run in parallel on different nodes.

It also contains a module for libraries and utilities, Hadoop Common, and a part responsible for scheduling cluster resources, Hadoop YARN (Banica et al., 2014).

Hadoop can be installed on any of operating system (Linux, Unix, Windows, Mac OS) and has more efficiency if running on multiple-node configuration (figure 3).

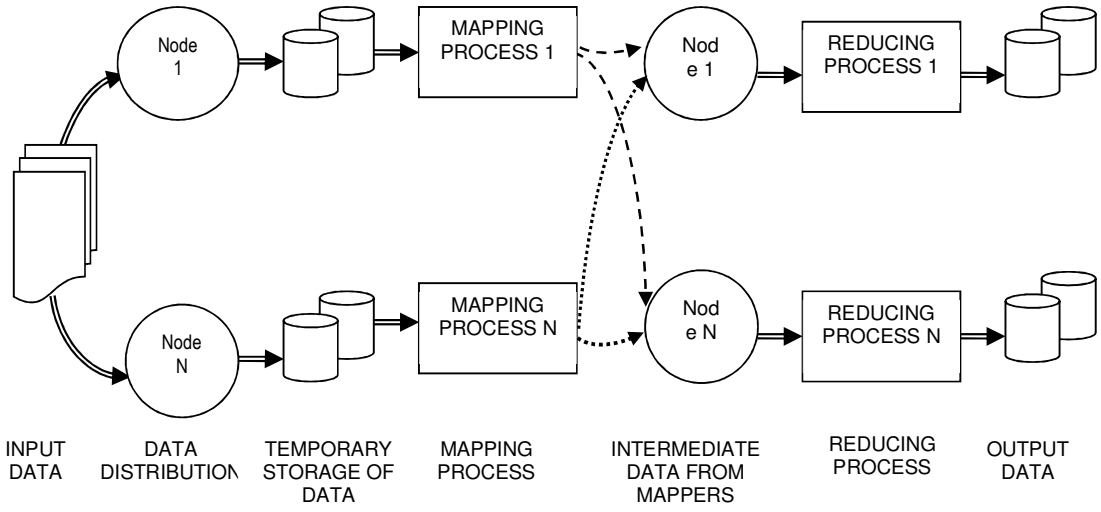

Figure 3. Big Data Processing with Hadoop (Source: Banica et al., 2014)

In order to realize a platform for Big Data, Apache foundation also launched several applications for collecting unstructured data (Apache Flume) and structured data (Apache Sqoop). After the layer of processing data (Apache Hadoop), the architecture must include an Analytics layer, in order to find correlations across multiple data sources, and to understand brand conversations, make forecasting or the social network analyze (Krebs, 2013).

3.1 Analyzing a Social Network with NodeXL

SNA software is based on network theory, using nodes that represent individuals and groups and ties which represent relationships between them, such as Facebook or Twitter friendships, email correspondence, bloggers opinions and many other miscellaneous hyperlinks. For example, marketing strategy can be further explored using SNA software, such as Gephi and NodeXL, both of them open-source tools for network visualization.

They could be used in marketing applications for defining the best offer for specific customers, the effects of a promotion campaign, to identify new product opportunities, optimize pricing, and improve customer service.

In such graphical representations, the marketers look for "brand ambassadors", known as typically loyal customers who are active and vocal on social media (Sharma, 2014).

Gephi is a free, open source interactive visualization and exploration platform for all kinds of networks and complex systems, capable of accommodating networks up to 50,000 nodes and 1,000,000 edges (Bastian 2009). Also, it generates metrics, identifies subgroups in a network, clusters of actors or individuals, or emphasizes isolated nodes of the network. The application is successfully used to analyze pages and groups of Facebook, Twitter networks and e-mail. Gephi works with imported files from .csv, .gml, .gdf and .gefx format, which can be achieved with software converters (e.g. Facebook or Twitter to .gdf files) from unstructured data.

NodeXL is a free, open-source template for Microsoft Excel that structures data for network analysis and visualization. It has a direct connection to social networks as Twitter, YouTube, Flickr and collects the publicly available data, and follows the relationships of users having public accounts (Lieberman**,** 2014).

With NodeXL it is possible to make a store or a brand marketing analysis, following up how its transactions are reflected on Facebook and Twitter activity, and on blogs and emails. The most powerful effect is produced by the graphical representation of the network, but most information results from metric calculations.

As to metric calculations, both tools are able to calculate degree, centrality, clustering coefficient and graph density of networks (Messarra, 2014).

Centrality identifies the most influential individuals in a social network and also the isolated persons. This measure shows the roles in a network: the leaders vs the isolates, the core of the network vs the periphery (Krebs, 2013).

Betweenness centrality represents the entity's position within the network, identifies the individuals holding a favored position in collectivity (SNA Diagrams, 2015).

Closeness centrality is one of the most significant SNA metrics because it represents the speed of information distribution between nodes of the network. It measures the distance (through direct and indirect links) from a node to all others within the network. An entity with a high closeness centrality can access more individuals and generally has quick access to other network members (Borgatti, 2005).

NodeXL completes the features of Excel spreadsheets with network data analysis and graphics capabilities. The main workflow includes three phases from data collecting until the meaningful network interpretation:

a) Data import – this option allows to extract data from different social media sources: e-mails, social networks, by activating the Import menu. The network is represented in the form of vertices (nodes) and edges (relationships that exist among the nodes). Some relationships are bidirectional and others are unidirectional.
b) Network analysis - includes the software routines for calculating metrics about individual vertices including in-degree, out-degree, and also closeness, betweenness and centrality. These metrics are also displayed in the workbook. It is recommended to analyse networks with a few thousands of nodes and edges due to memory and spreadsheet restrictions, even the latest

version of Excel limits spreadsheet size to the limits of the computer's memory. NodeXL calculates statistics for individual vertices, and these statistics are added to the spreadsheet as additional columns.

c) Graphical representation of the network – NodeXL provides graphical options for the overall layout of the network as well as for the vertices and edges. An important feature is the ability to filter the network in order to refine the graphical representation.

4. A MARKETING ANALYSIS EXAMPLE USING NODEXL

In this study we present the succession of steps required to collect information on Twitter, to filter and analyze data about a chosen subject, using NodeXL software. Also, we explore the same dataset, exported from NodeXL, with Gephi software and we make a comparative analyze of the results. Before starting it is necessary to have a Twitter account, and a NodeXL authorization to import Twitter networks.

The process has three main steps, from data import to the graphical representation of the network and calculation of metrics, as follows:

1) *Import data* – the application option is "Import from Twitter Search Network". We choose as reference @Prada (figure 4), and limited the import to 100 tweets.

The template includes a worksheet for Vertices and another for Edges and an overview of the network's metrics (Overall Metrics).

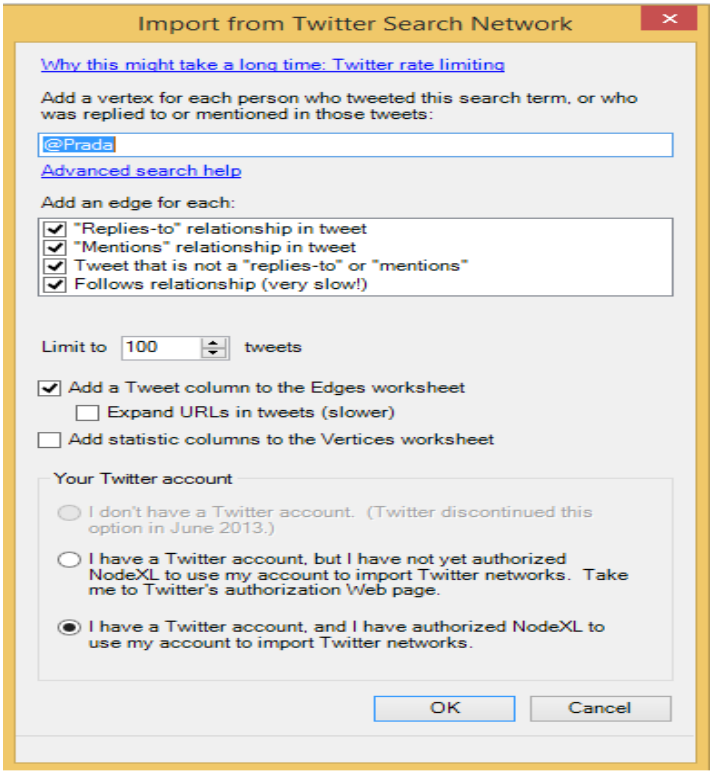

Figure 4. Importing data from Twitter

Each Twitter entity is a vertex and has some characteristics within the network, such as: the followers and the entities which this user follows, the Web address, the number of comments.

In the Edges worksheet are the relationships between nodes, and are represented as pairs of names (Smith, 2009).

2) Calculate graph metrics - the menu option is "Graph Metrics" (figure 5). A range of measurements of the network can be calculated for each vertex, but also for the entire network: degree, betweenness and closeness centrality.
3) Show graph – this option activates the graphical visualization of the network vertices and edges. The network could have thousands of vertices and it is necessary to apply *dynamic filters* in order to select the nodes, depending on some attributes, such as: the degree of connection to other nodes, the betweenness or closeness. By using dynamic filters are identified the nodes having critical roles as bridges, sinks, or sources within the network (Smith, 2009).

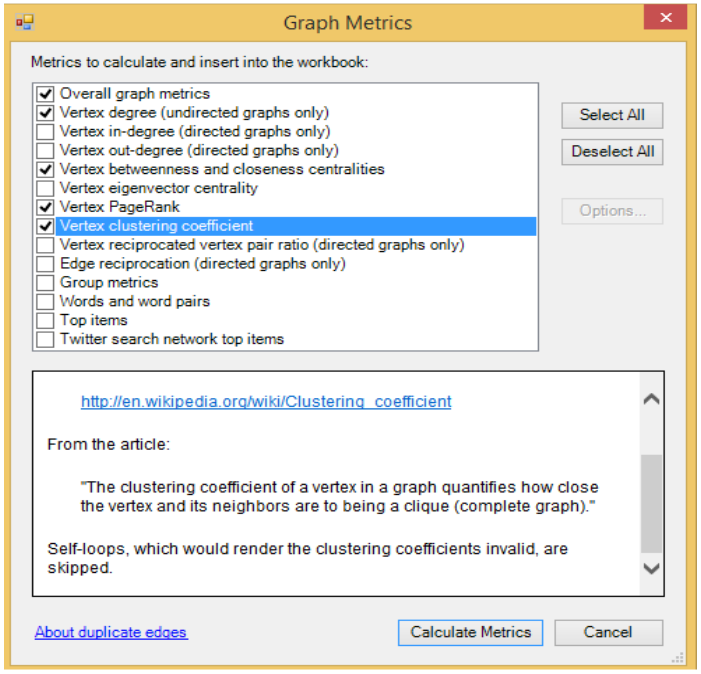

Figure 5. Calculating network metrics

In our example, we selected the vertices with the degree higher than 4 and the resulting network is represented in figure 6. The degree represents the number of all connections, to- and from the entity.

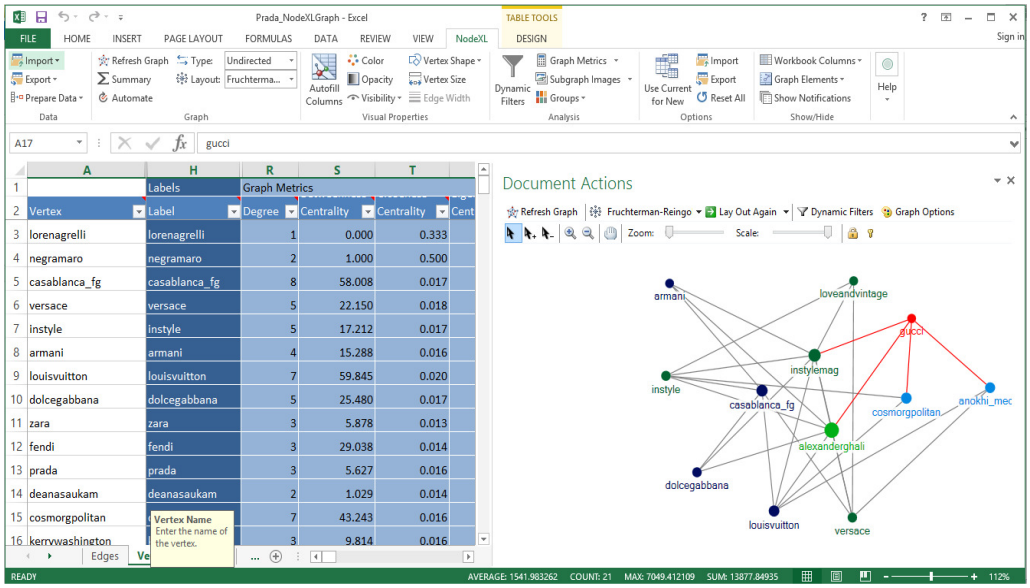

Figure 6. Viewing the network with NodeXL

Another important feature of NodeXL is the capability to export data in multiple formats, which may constitute the input data for other software applications. For example, the GraphML format creates files which may be processed with Gephi tool (figure 7)

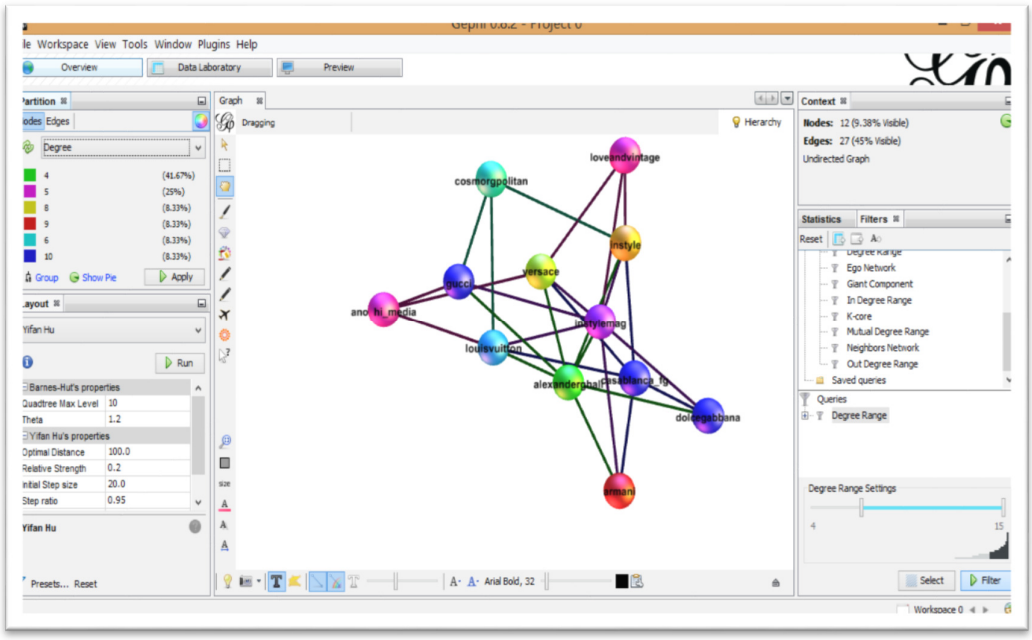

Figure 7. Viewing the network with Gephi

To get a clearer perspective about the selected Twitter network, would be interesting to make a comparative analysis of the results obtained with both software applications, in terms of graphics, and metrics. For example, applying a dynamic filter of degree equal or higher than 4, will lead to similar graphs (figure 6 and figure 7)

Finally, a network can be deciphered by the interpretation of key metrics, available in NodeXL and Gephi reports. These values can be useful in order to compare networks and the software capabilities. In our example, the metrics for the network are shown in figure 8 and are similar regardless the software tool used.

Table 1. Key metrics of the network

Graph Metric	Value
Graph Type	Undirected
Vertices	125
Unique Edges	239
Edges With Duplicates	10
Total Edges	249
Average Degree	3.888
Average Betweenness Centrality	1.314
Average Closeness Centrality	0.003

The combination of graphical network representation and statistical analysis is very important for a marketing study and both software applications have these facilities.

NodeXL has the advantage of working with the Excel spreadsheets for data handling and allowing direct connection to social networks, while Gephi offers a better graphical module. After using both SNA tools and making a comparison of their features, we believe that NodeXL application is more powerful than Gephi.

5. CONCLUSIONS AND FUTURE WORK

The subject of social network analysis is becoming increasingly significant in business as it provides useful, honest opinions of customers about products and company's brand. A social network analysis also provides information about the connections in a network, the "hierarchy" of entities, their influence and position in establishing the group bridges.

Exploring social media using SNA software will become one of the most effective marketing techniques, which gives knowledge about customer satisfaction, opinion leaders and centers of influence.

This paper mentions only a minimal set of network measures calculated in NodeXL and Gephi. Still, in a comprehensive analysis the input data set is much higher so it implies a longer period of searching the network, and larger limitations (thousands of vertices), which involves significant hardware resources and Big Data processing.

The current study is performed only on the social network Twitter, but the research must be extended on other social media sources, such as Facebook, Instagram, and LinkedIn.

With Big Data organization and analytic tools, companies can find out how they are perceived on the market and what can be done to improve the customers' perception.

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