On the Investigation of Social Network Analysis for E-Commerce Transaction in South-West Region of Nigeria

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ON THE INVESTIGATION OF SOCIAL NETWORK ANALYSIS FORE-COMMERCE TRANSACTION INSOUTH-WEST REGION OF NIGERIA

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Abstract

An investigative survey of the application of Social Network Analysis on e-commerce is presented and methods to improve e-commerce activity in this region is reported. The research reviewed relevant papers by survey based on the existing research work in the field of e-commerce, using social network analysis. This research presents an investigation on the application of social network analysis on e-commerce, with a case study of the user's perception in the South West Region of Nigeria. An investigation that was carried out revealed the different research works of others and the research was built upon by the metric presented. This approach was applied to influence the importance of Social Network Analysis in e-commerce. The data collected and the methods used by researcher proved the usefulness of the measures used in Social Network Analysis of e-Commerce. This research shows that the importance and potential of Social Network Analysis on e-commerce, is particularly, based on how Social Network Analysis has been used to improve e-commerce recommender systems which can give users a better shopping experience in Nigeria. Using Social Network Analysis for E-commerce in South west Nigeria to improve e-commerce activities.

Keywords: Nigeria; social network analysis; recommender systems; vendors; e-Commerce.

1. Introduction

Social Network Analysis is a technique for investigating social structures and to employs network theory methods in order to analyze social networks activities based on social relationships. According to Pinheiro (2011), networks systems are made up of nodes, which form the entire network such like individuals, groups or organizations were connected by edges of interactions, relationships, friendship networks, kinship, and financial transactions[1].

The research work of Alessia (2009), discussed how Social Network Analysis can be made possible to visualize social structures such as social media networks, disease transmission, transactions, kinship through sociograms (a

graphical representation of social links)[2]. Sociograms represents nodes as points and ties between the nodes as lines.

Evelien[3], presented that there has been an increased interest in social network analysis and stated other related fields of study where networks play an important role with examples, which includes computer science, geography and artificial intelligence.

Cassidy [4]defined e-commerce as a cashless method of transaction that can be done electronically, by using the internet and networks.

Turban et al (2003), in their paper put readers into realization that over the years, e-commerce has evolved from just buying and selling[5]. This is extended to other businesses, as related task to such as inventory of goods, logistics of goods, managing production and after sale services.

The acceleration of the internet era has made the e-commerce industry grow rapidly and thus, every commerce based organization has found e-commerce website indispensable[6]. However, the e-commerce industry in developing countries is still lagging behind to satisfy the dynamic and challenging needs of its users. This paper investigated on different application of social network analysis of e-commerce. Some related research works would be summarized and also, the methods of gathering data for social network analysis and with different measures of centrality, which plays a key role in analyzing social networks including, a brief of discussions and suggestions for further work.

This section presents a summary of research work carried out on the importance of Social Network Analysis and its application on e-commerce business transaction.

1.1 Social network analysis in e-commerce

Mohammad Dehghan[7] used social network analysis to develop a recommendation algorithm for customer to customer on e-commerce model, by considering special features of customers to customers on e-commerce websites. The research of Mohammad (2014), focused on users and transactions, which formed the map and the network which made it possible to incorporate link prediction techniques that are used in building the recommender system. According to Ehsan et al[8], their research work diverted focus on the application and also, the necessity of social networking in e-commerce using a case study of Etka Chain Store[9]. This research showed the significant relationship between e-commerce and commercial, cultural, legal, technological and social network infrastructures and also notes social network as one of the main factors in the growth of e-commerce.

Stephen Guo (2011), presented paper on the role of social networks in online shopping using taobao. This is one of the largest e-commerce website that are able to find out determine communication between buyers, a fundamental

driver of purchasing activity, which demonstrated that social network is an important feature that can be used to predict how consumers choose who to transact with[10]. But, Jianming (2010), presented a social network based recommender system that inferred recommendation through considering users own preference, and the general acceptance of an item with the influence from friends[11]. Tad hogg carried research work on inferring preference correlation from social networks to identify consumer preferences as a challenge in customizing e-commerce sites for individual users[12]. This research further evaluated the advantages of inference from online social networks as it was built on Yunhong XU (2009), which focused on using social network analysis as a strategy for e-commerce recommendation. This research presented some examples to depict how social network analysis can be used for providing personalized recommendations to customers and research opportunities[13]. Swamynathan (2008), argued on social market places to see if social networks improve e-commerce. The research focused only on overstock auctions using a novel auction site that can integrate social links into user profiles[14]. There is a research recommendation system that makes use of trading relationships to calculate the level of recommendation for trusted online auction sellers[15]Wang jyun-cheng (2008), presented research on trusted online auction and recommended trusted online auction to sellers using Social Network Analysis[16]. However, the impact of social connection on business transactions was evaluated by Swamynathan et al.; to found out that those that transact with friends of friends can obtain higher user satisfaction than those that do not transact with friends of friends[17]. In this research, Social Network Analysis metrics is formulated and to be applied on e-Commerce transactions.

2. Methods Used For Social Network Analysis In E-Commerce

Social network analysis applies network theory to analyze social networks in terms of social relationships. Networks are classified as sets of nodes (individuals, groups, and organizations) connected by edges (relationships, friendship, kinship, financial transactions). Nodes and edges form networks and thus, networks could either be offline networks or online networks. Offline networks are based on relationships among nodes in the network, relationships like communication between nodes, kinship, friendship while online networks are in the form of online social networking websites like Facebook, Instagram and Twitter that allows users to interact via chatting, sharing pictures, sending messages etc.

2.1 Methods for analysis

There are four measures of centrality that are widely used to analyze social networks: degree centrality, betweeness centrality, closeness centrality and eigenvector centrality.

2.1.1   Degree centrality

Degree centrality refers to the number of direct links or connections to a node in a network. A node with high degree centrality in a network is considered to be a very important node in that particular network. In a directed network, that is, if the ties or edges have direction, two measures of degree centrality can be defined as indegree and outdegree. Indegree involves several nodes being directed to a single node. This represents the importance of that node in the network and are often said to be prominent or have high prestige in the network. Outdegree on the other hand involves a single node being directed to many other nodes, that is, nodes with high outdegree centrality are often referred to as influential nodes. Degree centrality of a node in a network can be mathematical represented as,

$$G_i = \frac{\sum j \in G A_{ij}}{N-1} \tag{1}$$

N.B social networks are generally represented as adjacency matrix A

Where A_{ij} refers to the element in the adjacency matrix A at ij^{th} position, N refers to the number of nodes in the network and (N-1) is the factor for normalization.

2.1.2   Betweeness centrality

Betweeness centrality is a measure used for identifying nodes that serves as bridges in a network. This is nodes that other nodes must pass through to pass information to another node. A node with high betweeness centrality is considered an important an influential node in a network. Betweeness centrality of a node in a network can be mathematically represented as,

$$B_i = \frac{\sum j,k=G^{g_{jk}(i)} / g_{jk}}{(N-1)(N-2)} \tag{2}$$

Where g_{jk} represents the total shortest part between two nodes j and k and $g_{jk}(i)$ refers to the total shortest path between j and k which passes through node i. (N-1) (N-2) represents normalization.

2.1.3   Closeness centrality

Closeness centrality emphasizes distance between a node and other nodes in a network that is, describing how fast other nodes in a network of nodes can be reached from a node. This can also be said to be the mean length of all shortest paths between a node and other nodes in a network. Closeness centrality of a node can be mathematically represented as,

$$C_i = \frac{N-1}{\sum j \in G\ d_{ij}} \tag{3}$$

Where d_{ij} represents distance or path length between two nodes i and j.

2.1.4 Eigenvector centrality

Eigenvector centrality tends to find the most central nodes in terms of the overall structure of the network. It can describe to be a measure of relative importance of a node, but in a term of reference and influence of that node to another node in the network. A node with a high eigenvector centrality is considered a leader node in the network because it is more central and has influence over other nodes in the network. According to Vedanayaki (2014), data mining techniques can help in eliciting needed data from a large set of data using social network analysis[17.] Generally, Eigenvector centrality can be represented as,

$$X_i = \frac{1}{\lambda} \sum_{j \epsilon N\,b_i} A_{ij} . X_j \tag{4}$$

Where Nb_i represents neighboring nodes of i and λ is eigenvalue. X_j is the eigenvector centrality of node j and A_{ij} refers to the element in the adjacency matrix A at ij^{th} position.

3. Discussion

Social network analysis has indeed improved electronic commerce and is helping e-commerce to reach its full potential year after year. With the help of social network analysis, especially in the area of recommender systems, social network analysis has made it possible for e-commerce vendors to satisfy customers by providing them with complementary products that previous customers have also acquired. Social Network analysis on e-Commerce helps with product ranking and with number of sales which convinces the customer to purchase the product and thus increases daily sale of the e-commerce vendors' products. According to MyBuys research (Kohler, 2015), it was recorded that there are over 100 top Internet sellers that uses recommender systems for recommending products to users in the shopping cart. This has resulted to a lead of 91.5% increase in conversion rate. This means that users of the products that were recommended are resulted in 91.5% of the product purchasing. This may classified as one of the recommended products which shows how much social network analysis has improved the user activity on e-commerce websites. Besides increase in conversion rate, social network analysis has also helped e-commerce vendors to gain better insights on customer preferences by data mining, which is sales behavior which has made it possible for e-commerce vendors to know how their customers think about which products they preferred as preferences to others.

4. Summary and Conclusion

This research presents an investigation on the application of social network analysis on e-commerce, with a case study of the user's perception in the South West Region of Nigeria. An investigation that was carried out revealed the

different research works of others and has built upon this by the metric presented to be applied as influenced the important of Social Network Analysis in e-commerce.

The data collected and also the methods used by researcher proved that the usefulness of the measures used in Social Network Analysis of e-Commerce. This research investigation showed that the importance and potential of Social Network Analysis on e-commerce, particularly, how Social Network Analysis has been used to improve e-commerce recommender systems, which has given users a better shopping experience. This research opens the opportunity for e-commerce vendors and to satisfy users, it may be incorporated on e-Commerce business transactions in the South West Region of Nigeria.

5. Further Work

Future research recommends finding on how social network analysis can be used on e-commerce related activities like e-marketing, for example, capability of e-commerce vendors to market through network of users and as a center of attraction to other potential users. The research may report on both quantitative and qualitative assessment of social network analysis on e-Marketing systems.

Acknowledgment

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