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Compatibility Measurement in Social Network Analysis: Literature Review

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Abstract

Abstract- According to the Big Data era, the social network has become one of the methods which are in great demand. Social Network Analysis can visualize the connections between two or more people in a social network. Social media is considered to retrieving data because it is honest and efficient. Another motivation is to understand the interaction pattern and identity of people in real-time. Authors using literature review by search the "social network analysis" keyword on 4 journal portals. From those keywords, obtained 21 selected papers to make a list by purpose and measurements. This paper is to compare and find compatibility measurement from across study in SNA. 7 from 21 selected papers using Centrality Measurement. Therefore, the study found that centrality is the most measurement to use in SNA.

Keywords: SNA, social network, centrality, influence, node

I. INTRODUCTION

Being permanently connected to the internet has tremendously grown in need over the years. Meet the user needs and expectations are developed on the worldwide web. The web has been developed and improved by moving from static web to user-generated content one, called web 2.0. [1]. social media has become part of this kind of new technology. The deployment of social media where "expressing tools allow users to express themselves, discuss and aggregate their social life", tools that allow us to share, publish something that we want, and interact with someone. [2].

Social Networks are the structure of interconnected users, created for social interactions. A graph in the mathematical analogy is like a collection of nodes representing users and links the connections between them. It could be a vital role in spreading pieces of information, opinions, ideas, etc. Social Networks have become popular because of could across the study like education, finance, politics, medicine and healthcare, entertainment, etc. even it can use for viral marketing, public opinion monitoring, recommender systems, political campaigns by spreading the information. [3]

SNA's various works can be grouped into three categories, namely structural analysis-analysis based on the structure and functionality of the network, Social data analysis- analysis based on the data being produced in the network, and social interactions analysis- analysis was done using social network user interactions [3]]. Social Network could be annotated by representations with SNA indices, an ontology that describes SNA notions, e.g., centrality, (Fig.1) [2]

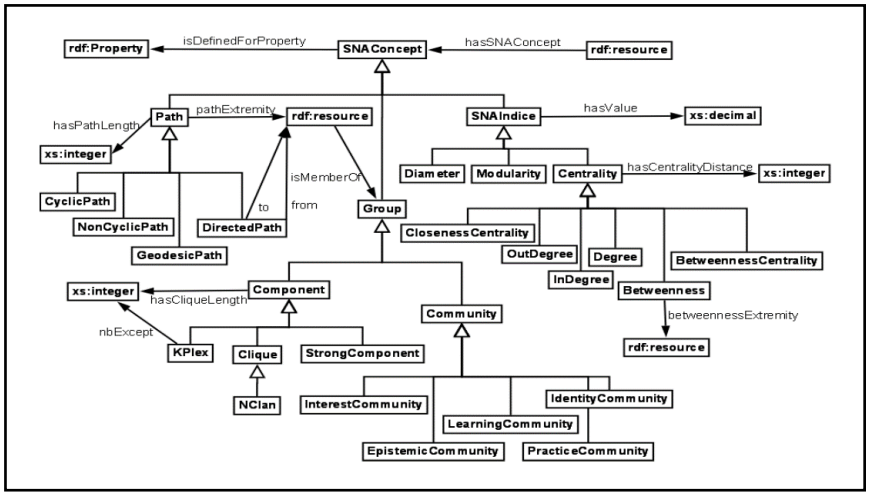

Fig 1. Schema of SemSNA : the ontology of Social Network Analysis

The main analysis in Social Network Analysis is focusing on measuring the frequency of social interactions that are modeled only with numbers; 0 or 1 on the graph. SNA can visualize the interaction a variety of issues, to measure how the people connect with others, how could be one person can affects the engangement between people and measure the individuals in a network are connected. [4]

This paper is concerned about the SNA could be a method to analyze multiple issues from across the study, with the characteristics from many of the analysis method in it.

II. LITERATURE REVIEW

Identifying the central nodes in a network is a purpose of the SNA. The graph represents the central position people or node in the network, which correlated with another nodes which is popular. To show every node of

the information to determine the centering graph. The most used centrality measurement are degree, closeness, betweenness, and eigenvector centrality [4]. There are most measurement use in SNA;

A. Degree Centrality

Degree centrality is defined as the number of degrees of relationship that is connected to a node. The degree centrality is defined in the formula [4], below :

$$C_D(V_i) = \sum_{k=1}^{n} a(V_i, V_k) \quad (1)$$

Where a(u,v) = 0 if u and v not connected by relationship, otherwise a(u,v) = 1.

B. Closeness Centrality

Closeness centrality measures how many nodes to another node. The central node is one that is close to other nodes in a network [4]. It can be measured by the formula:

$$C_C(V_i)^{-1} = \sum_{k=1}^{n} d(V_i, V_k) \quad (2)$$

C. Betweenness Centrality

It measures the number of the shortest path that passes through the node. It can be measured by the formula [4][5]

$$C_B(V_i) = \sum_{k=1}^{n} \sum_{k=1}^{j-1} g_{jk}(V_j)/g_{jk} \quad (3)$$

D. Eigenvector Centrality

It measures the most influential nodes in a network with the highest score is the node that neighbors have great value. It can be measured by the formula [4]. :

$$C_i^e = \frac{1}{\lambda} \sum_{j:j \neq i} y_{i,j} c_j^e \quad (4)$$

II. RESEARCH METHOD

The presentation of the experimental methods should be clear and complete in every detail facilitating reproducibility by other scientists. To know the purpose of SNA from multiple across a study by searching a particular literacy, and collecting analyze the related works. The researcher made some steps are;

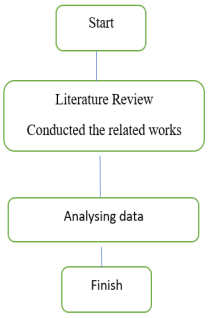

Fig2. Schema of research method

A. *Motivation*

Along the SNA has become an important issue, and impact on knowledge sharing, social commerce, social interaction, among many others. However, information an attempt to address this knowledge, this study is giving a correlation and comparison what the analytical measurement of SNA. [4]

B. *Literature Search*

The beginning of the step is to determine SNA in any of the journals across the study, and collect some articles that similar materials. The journal search can be in an international publication portal, and the researcher restricted to be 4 main portals, are;

1. ScienceDirect
2. SpringerLink
3. ResearchGate
4. IEEE explore

By entering the keywords “Social Network Analysis”, then the journals could be shown as;

Table 1. Literacy Number

Portals	Downloaded	Selected papers
IEEE explore	57	1
SpringerLink	65	9
ScieneDirect	78	10
ResearchGate	42	3

C. *Research Questions*

Based on schema research, it can be found that the research questions are;

RQ1: Does the SNA can apply on multi across study?

RQ2: If it does, how SNA works on their part of those studies?

III. RESULTS AND DISCUSSION

A. RQ1. Does the SNA can apply on multi across study?

The listing papers who search by entering the keywords on the journal portals could be classified in Table 2.

Table 2. List of Search Papers

No	Tittle	Year	Analysis Measurement	Reference	Purpose
1	Collaborative Social Network Analysis and Content-based Approach to Improve The Marketing Strategy of SMEs in Indonesia	2015	Centrality, Content-Based Approach	[5]	Small and Medium Enterprises (SMEs)
2	Social Network Analysis and Digital Learning Environments: A Framework for Research and Practice Using the SAPO CAMPUS Platform	2016	Degree, In-Degree, Out-Degree, Centrality	[6]	SAPO campus (education)
3	Social Network Analysis Untuk Analisa Interaksi User Dimedia Sosial Mengenai Bisnis E-Commerce (Studi Kasus: Lazada, Tokopedia Dan Elevenia)	2018	Centrality	[7]	E-commerce

4	Application Of Clustering To Analyze Academic Social Networks	2013	Clustering	[8]	Academic
5	Enriching Live Event Participation with Social Network Content Analysis and Visualization	2014	ECSTASYS Framework	[9]	Social Network
6	Social Network Analysis on Grain Production in the Brazilian Scenario	2015	Centrality	[10]	Grain Production
7	Social Technologies in Education - An Actor-Network Analysis	2013	An Actor-Network	[11]	Government and Public (education)
8	Continuous state online influence maximization in social network	2018	Influence Maximization	[12]	Social network
9	Analysis of a Real Online Social Network Using Semantic Web Frameworks	2009	Semantic Web Framework	[2]	Social Network
10	Using social network analysis of human aspects for online social network software: a design methodology	2016	Centrality-based analysis	[13]	Human aspects of Social Network
11	Correlating PerformanceWith Social Network Structure Through Teaching Social Network Analysis	2006	Network-Centric Collaboration	[14]	online communication behavior
12	Influence Maximization in Social Networks With Non-Target Constraints	2018	Constrained Influence Maximization	[15]	Target-Non-target Distribution
13	Cross-Cultural Analysis of Social Network Services in Japan, Korea, and the USA	2009	dimension and corresponding values	[16]	social networking sites
14	Using Social Network Analysis Techniques to Study Collaboration between a FLOSS Community and a Company	2008	average coordination degree, centrality	[17]	FLOSS projects
15	Characterizing Instructional Leader Interactions in a Social Learning Management System using Social Network Analysis	2019	Influence and Betweeness Measures	[18]	public school learning network
16	A Privacy Preserving Algorithm Based on R-constrained Dummy Trajectory in Mobile Social Network	2017	RcDT	[19]	Location Privacy Preserving
17	Hurst exponent based approach for influence maximization in social networks	2019	Hurst-based Influence Maximization, HAC-Rank	[3]	Social Network
18	Selectivity in posting on social networks: the role of privacy concerns, social capital, and technical literacy	2020	Modelling agility, qualitative analysis	[20]	Social network
19	On the Algorithms of Identifying Opinion Leaders in Social Networks	2019	Centrality , page rank	[21]	Social Networks

20	Understanding trust on social networking sites among tertiary students: An empirical study in Ghana	2019	PLS-SEM	[4]	social networking sites (SNS)
21	Key players in the Grieg NL Placentia Bay Atlantic Salmon Aquaculture Project: A social network analysis	2020	Communication network	[22]	Food Industries
22	An UML to OWL based approach for extracting Moodle's Ontology for Social Network Analysis	2019	OWL (Web Ontology Language)	[1]	Social Interactions

RQ2: If it does, how SNA works on their part of those studies?

SNA determine the network that visualizes the nodes that connected one another. the networks are constructed based on the previous definitions and degrees and costs of relationship have been calculated for linked nodes. [17].

The use of measurements is to define a wide range of parameters of the network that can help to characterize the network and its nodes. By that, each of the studies can be calculated through measurements on SNA. The framework's point of view, augmenting the participation experience to live events through social network content enrichment and linking. [9]

By searching the measurement analysis in some papers, researcher assume and group by their purpose, such are table 3;

Table 3. Correlation between Purpose and SNA Measurements

Purpose	Analysis Measurement			
	Centrality	Framework	Influence	Others
Social Network (general)	√	√	√	√
Government	√		√	
Industries	√			√
Education	√			√

V. CONCLUSION

7 from 21 selected papers using centrality measurement to use in SNA. This paper has shown that Centrality is a measurement that suits multiple across the study in SNA. In other studies, centrality can combine with some other measurements by knowing of characteristics from the field that want to research. SNA helps people to know how the networks work on a social network. and it can show the actor who makes many motions by nodes and sharing information. For further research, the measurements in SNA can more compatible with other fields and across the study by the experimental new framework.

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