Social Network Analysis of Hadith Narrator(Case Study: Shahih Hadith of Imam Bukhari from Software Ensiklopedi Hadits Kitab 9 Imam)

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Abstract— This research was about narrators data of shahih hadith Imam Bukhari data from software Ensiklopedi Hadits Kitab 9 Imam was created by Lidwa Pusaka. The purpose of the research was to got the central narrators and the central country life of narrators in shahih Bukhari book. The central narrators and the central country life of narrators was be determined with graph on Social Network Analysis (SNA). SNA was a data mining technique in connecting several interrelated objects through graphs. The narrators had major role (good centrality) was Syu'bah bin Al Hajjah and Muhammad bin Muslim bin 'Ubaidillah. The central country life of narrators was Bahrah and Kufah in Iraq and Medina in Sudi Arabia..

Index Terms— shahih hadith Imam Bukhari, the country life of narrator, narrator, SNA.

CHAPTER ONE
INTRODUCTION

1.1. Backgorund

Al-Qur'an and hadith of Prophet Muhammad SAW are very reliable source of law for muslims. Al-Qur'an is the holy book which contains the words of Allah SWT as revelation to the Prophet Muhammad SAW through Jibril and as guide of life for all human until the end of time. Hadith is the words and deeds of the Prophet Muhammad SAW. Most Muslims know and having Al-Qur'an as guidance than hadith. Actually, hadith is the second only to Al-Qur'an in Islamic jurisprudence. Hadith is important tools to understanding something in the Al-Qur'an is global or vague [7].

The companions of prophet had recorded the entire of Al-Qur'an at the time of the Prophet Muhammad SAW was still alive. Thus, recording and memorization of the verses Al-Qur'an was in the direct supervision of Prophet Muhammad SAW, so that Al-Qur'an is the holy book of the most original today. Meanwhile, the history of recording and collecting hadith of the Prophet Muhammad SAW was not the same with the history of recording and collecting the Al- Qur'an. At the time of the Prophet Muhammad SAW, not all hadis of the Prophet Muhammad SAW recorded by his friends. Recording of the hadith of Prophet Muhammad SAW was very difficult to do. One reason for the difficulty was not every hadith witnessed by many companions of prophet [6].

Hadith that can be used as guidelines in the formulation of the teachings of Islam is a hadith that maqbul (received), the hadiths are shahih and hasan. In addition hadith maqbul, there are also hadith mardūd, the hadith is rejected and illegal use as a proposition of law or the teachings of Islam [1].

The one important aspect discussed in the knowledge of hadith was about the principles to understanding the narrator (sanad) and editorial (matan) a hadith in terms of accepted and rejected. Narrator was the person whom related hadith. Hadith acceptable if the chain (sanad) was attached (narrators were connected) from the beginning to the end of the sanad. The connecting narrator of hadith formed sanad. According to Imam Bukhari that rawi hadith had met or even just one touch [1].

A lot of data and narrator hadith was spread until now.. Statistics as an important science in the processing and interpretation of the data had been widely applied in various areas of life such as economic, social, industrial, health, and others. This study tried to applied statistics in the field of religion (Islam) to explore the relationship between the narrator.

As technology grows, the need for analysis to explore large amounts of data is increasing. Data mining is one method of Statistics which has an important role in extracting large amounts of data. The sanad hadith data which consists many rawi requires data mining analysis. The sanad hadith data is stored in the database of hadith. In this study, researcher uses data from the book of Imam Bukhari hadits.

Relations between narrators attract traced associated with narrators who have a major role in the transmission of hadith. A major role in this case means that the narrators who became the central figure, the narrators liaison, and narrators who have a close relationship with other narrators. The central figure in this case means narrator most associated or jointly narrated a hadith with other narrators. The central figures (narrators) will be determined through a graphic on Social Network Analysis (SNA). SNA is a data mining analysis in linking some objects are interlinked via graphic [5].

1.2. Objective of the Study

The purpose of this study was to find figures (narrator) and the country live narrators become central to the narration hadith of Sahih Bukhari Hadith Book.

1.3. Significance of the Research

Researchers hope that this research can facilitate Muslims to study the science of hadith which related narrators with more modest

1.4. Scope and Delimitation of the Study

This research was conducted on the narrator data of sha-

hih hadith compiled by Imam Bukhari for one lane hadith sanad

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Hadith

Hadith is the words and deeds of the Prophet Muhammad. Hadith as a source of law in the Islamic religion has a second position at levels below the legal sources in the Qur'an. The term hadith in Islamic terminology means to report or record a statement and behavior of the Prophet Muhammad. But at this moment the word hadith has expanded meaning, so synonymous with the sunnah, atsar and Taqrir, then it could mean all the words, acts, statutes and approval of the Prophet Muhammad who made statutes or laws [2]

There are two major components in the sanad and matan hadith. Sanad is to bring together the narrators come to matan hadith, from one narrator to narrator on it and so on until the lafadz hadith. Linkage narrators is called sanad. Narrators are people whose role in the hadith narrated by the friends of Prophet, *tabi'in, tabi'ut tabi'in* until *tabi'ul atba'*. Experts hadith in applying the laws of the hadith is unfounded or rely on this sanad. Meanwhile, matan is words or lafadz which falls at the end of the chain of transmission. For example, in the Hadith Bukhari in Al-Madiinah Fadhaailu chapter, which means:

"Musaddad has told to Yahya, from Ubaidullah bin Umar, he said from Habib bin Abdur Rahman, from Hafash bin Asim, from Abu Huraira, the Prophet, he said," Place between my house and my pulpit is a garden from the gardens of Paradise (rawdah), and my pulpit is my Lake Fount (Al-Kauthar)"

Based on the hadith can be seen that the linkage narrators from Musaddad up to Abu Hurairah called sanad, while the words of the Prophet Muhammad after sanad called matan [1]

2.2 Social Network Analysis (SNA)

Social Network Analysis (SNA) is a data mining analysis in linking some objects are interlinked via graphic [5]. Objects of SNA is called the actor is the main focus in this analysis. There are network / graph consisting of nodes that represent actors anda edges that represent actor interaction. This graph is usually called sosiogram, while the matrix that describes the relationship between actors called sociomatrix. There are two levels of translation of a network, the Global Graph Properties (GGP) and Single Actor Properties (SAP). Global Graph Properties describes the characteristics of social networks as a whole. While Single Actor Properties (SAP) focuses on the role of actors in the social network.

There are two types of relationship that can be described in the SNA, namely [9]:

1. Directional Relations: the type of relationship "self choices" that the relations between actors is the choice of each actor and does not apply of each other, let the friendship between A and B. If A concede B as a friend is not necessarily B will admit A as a friend. This relationship will be denoted by arrows (with directions) on sosiogram. In matrix notation, this relationship can be described as follows:
   X: sociomatrix friendship with A, B and C. If it is known that the A is friend with B (A → B), B friends with C (B → C), C befriend A (C→ A), and C is friend with B (C → B). If the relationship is dichotomous, the elements of the matrix **X** (x_{ij}), with i = A, B, C and j = A, B, C are:

$$\mathbf{X} = \begin{bmatrix} - & 1 & 0 \\ 0 & - & 1 \\ 1 & 1 & - \end{bmatrix}$$

2. Nondirectional Relations: types of relationships between actors mutually symmetrical. Examples of this relationship is the next-door neighborly relations. If A neighbor next door to B then it is definitely next-door neighbors and also with A. This type of relationship will be denoted by a line (without arrows) on sosiogram. In matrix notation, this relationship can be described as follows:
   X: sociomatrix neighborliness next door A, B and C. If it is known that A neighbor next door to B (A-B and B-A), B neighbors next door to the C (B-C and C-B). If the relationship is dichotomous, the elements of the matrix **X** (x_{ij}), with i = A, B, C and j = A, B, C are:

$$\mathbf{X} = \begin{bmatrix} - & 1 & 0 \\ 1 & - & 1 \\ 0 & 1 & - \end{bmatrix}$$

The relationship in SNA between the actor could be worth dichotomous and has value. The relationship is dichotomous, if this relation exists then a value of 1 and if there is no relationship will be worth 0. Relation can also be of value so any relationships between actors have different values, it could be worth the power relationships between actors, the intensity or frequency of intercourse.

2.3 Geodesic Distance

Geodesic distance adopted from Graph Theory is the most fundamental measure in sosiogram. Geodesic distance is denoted by $d(i,j)$ which means that the geodesic distance between the actors represented by nodes, , n_i and n_j. Geodesic distance is the shortest path between the two actors, formulated as follows [4]:

$$d(i,j) = \min(x_{ih} + \cdots + x_{hj}) \quad (1)$$

where: x_{ij} = elements of sociomatrix **X**
i,h,j = index of actors in *network*
h = actor intermediary in relations between actors i and j in a network.

If an actor is isolated or unreachable or no relationship at all with the other actors, the geodesic distance from the actor can not be defined.

2.4 Degree Centrality (DC)

Centrality of SNA is one measure to look at the position of an actor / group in a sosiogram. Actor degree centrality is many direct relation which have by an actor. Freeman (1979) [3] set that $C_D(n_i)$ is the actor-level degree centrality index, where:

$$C_D(n_i) = d(n_i) = x_{i+} = \sum_{j=1}^{g} x_{ij} = \sum_{j=1}^{g} x_{ji} \quad (2)$$

with: n_i = actor to 1
g = the number of actors in network

x_{ij} = elements of sociomatrix **X** row to-i, column to-j

2.5 Closeness Centrality (CC)

Closeness is a value that measures the closeness between the actors. An actor is referred to as central of a network if it can interact with other actors more easily and quickly. Closeness uses geodesic to measure the centrality of an actor. Actor closeness centrality index is formulated as follows [8]:

$$C_c(n_i) = \sum_{j=1}^{g} \frac{1}{d(n_i, n_j)} \quad (3)$$

with: n_i = actor to-i , i≠j
g = the number of actors in network
$d(n_i, n_j)$ = *geodesic distance* between actor to-i and to-j

2.6 Betweenness Centrality (CC)

The interaction between two or more actors sometimes rely on other actors who become intermediaries in the network. This intermediary actors often have an important role in the flow of information as in control of the interaction between these actors. Betweenness of actor is a number presence of actor in geodesic (shortest path) every couple of other actors compared to the large number of couples geodesic these actors in the network. The actor with the highest betweenness values is an actor who often acts as an intermediary, and considered to hold control over the flow of information within the network. Size betwenness actor centrality index is formulated as follows (Wasserman and Faust 1994):

$$C_B(n_i) = \sum_{j<k} \frac{g_{jk}(n_i)}{g_{jk}} \quad (4)$$

with: $g_{ik}(n_i)$ = the number of geodesic between actors j and k actor all through the actor to-i,
g_{ik} = the number of geodesic between actor to-j and actor to-k.
n_i = actor to-i , i≠j , i≠k

CHAPTER THREE
METHODOLOGY

3.1. Data

The data used in this research is secondary data. Source of data derived from the book of hadith Imam Bukhari collected in the software Ensiklopedi Hadits Kitab 9 Imam published by Lidwa Pusaka. There are 7008 shahih hadiths with the narrators. The variables used in this study is the hadith narrator and the country life of narrator

3.2. Analysis Method

a. Data Exploration:
data exploration for narrators with creating a bar chart based on the deployment of the country life narrators
b. Social Network Analysis:
- Make co-authorship matrix
- Build a network and count the centrality

CHAPTER FOUR
DATA PRESENTATION AND ANALYSIS

4.1. Data Exploration

Based on the hadith software known that there are 7008 hadiths and 1446 narrators involved in shahih hadith compiled by Imam Bukhari. In addition, it is also known a number of countries where life narrators. Here is an example of the data transmitters of hadith Imam Bukhari:

Table 1
Sample data shahih hadith narrators of Imam Bukhari

No. Hadith	Initial	Narrator's Name	Country Life of Narrator
1	r1273	Umar bin Al Khaththab bin Nufail	Medina
1	r392	Alqamah bin Waqash	Medina
1	r933	Muhammad bin Ibrahim bin Al Harits	Medina
1	r1367	Yahya bin Sa'id bin Qais	Medina
1	r1168	Sufyan bin 'Uyainah	Kufah
1	r92	Abdullah bin Az Zubair bin 'Isa	Marur Rawdz
2	r280	Aisyah binti Abi Bakar Ash Shiddiq	Medina
2	r1301	Urwah bin Az Zubair bin Al 'Awwam	Medina
2	r628	Hisyam bin 'Urwah bin Az Zubair	Medina
2	r814	Malik bin Anas bin Malik bin Abi 'Amir	Medina
2	r155	Abdullah bin Yusuf	Maru
:	:	:	:
:	:	:	:
7008	r202	Abdur Rahman bin Shakhr	Medina
7008	r235	Abu Zur'ah bin 'Amru bin Jarir	Kufah
7008	r1285	Umarah bin Al Qa'qa'	Kufah
7008	r925	Muhammad bin Fudloil bin Ghazwan	Kufah
7008	r262	Ahmad bin Isykab	Maru

Meanwhile, the spread of the country life of the narrators is shown in the graph in Figure 1. Based on these images were known that most of the narrators lived in Medina (375 narrators). Medina is the city where the Prophet emigrated spread the religion of Islam for 10 years. The Islamic teachings in Medina period is regarding social. Da'wah of Prophet Muhammad in Medina is more developed and accepted by the public than when the Prophet Muhammad in Mecca. It thus becomes reasonableness when many of the hadiths of Prophet Muhammad conveyed and recorded by the companions (narra-

tors) as a source of Islamic law in the Medina.

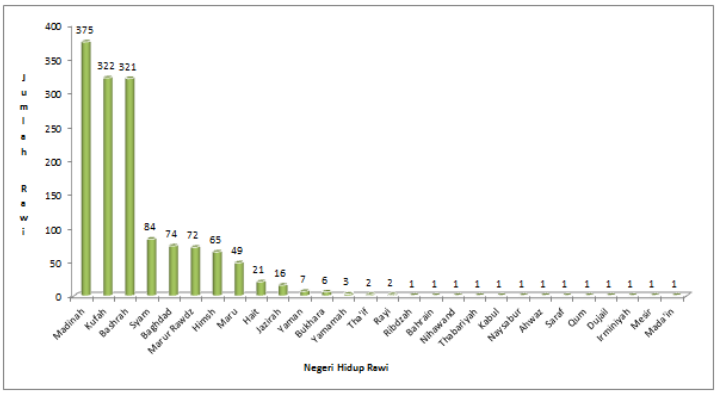

Fig 1. Graph the spread of country life narrators

4.2. Social Network Analysis

Social Analysis Netwrok (SNA) is formed between narrators shahih hadith book of Imam Bukhari basically looks there are several narrators who have a major role in the transmission network hadith. A narrator said to have a major role if it has a good centrality. Table 2 shows that based on the value of CC is basically between narrators have the closeness that is not much different. Shu'bah bin Al Hajjaj has a DC value most is 149, followed by Muhammad bin Muslim bin 'Ubaidullah of 97, and Sufyan bin Sa'id bin Masruq of 90. This shows that Shu'bah bin Al Hajjaj has a direct relationship with the other narrators at most compared to others in the network of narration hadith. Based on the value of BC is seen that Muhammad bin Muslim bin 'Ubaidullah BC greatest value is 462140.1. This means that Muslim bin Muhammad bin 'Ubaidullah is the narrator of the most frequent is between two narrators or most often the liaison between other narrators.

Table 2
Centrality narrators shahih hadith book of Imam Bukhari

No.	Narrator's Name	Country Life of Narrator	DC	BC	CC
1	Syu'bah bin Al Hajjaj	Bashrah	149*)	107254	222.1
2	Muhammad bin Muslim bin 'Ubaidillah	Medina	97	462140.1*)	308.2
3	Sufyan bin Sa'id bin Masruq	Kufah	90	58886.2	210.3
4	Sufyan bin 'Uyainah	Kufah	83	62885.7	207.6
5	Anas bin Malik bin An Nadlir	Bashrah	77	9179.5	331.4
6	Abdullah bin 'Abbas bin 'Abdul Mutha-lib	Marur Rawdz	71	10461.4	392.1
7	Malik bin Anas bin Malik bin Abi 'Amir	Medina	71	43095	213
8	Abdullah bin 'Umar bin Al Khaththab bin Nufail	Medina	66	237495	341.2
9	Abdur Rahman bin Shakhr	Medina	63	383.1	426.8
10	Sulaiman bin Mihran	Kufah	54	34035.1	248.5
11	abdul malik bin 'abdul 'aziz bin juraij	Marur Rawdz	51	38429.6	226.8
12	Yahya bin Sa'id bin Qais	Medina	50	24438.6	243.5
13	Hisyam bin 'Urwah bin Az Zubair	Medina	50	14663.7	281.9
14	Nafi' maula Ibnu 'Umar	Medina	47	40411.7	310.2*)

*)good *centrality*

In addition to seeing SNA between narrators, also conducted an analysis of country life narrators. This is done to see the spread of shahih hadith by country life of narrators. Figure 2 displays the distribution of country life narrators showed that tend to form one large group and led to the town of Saraf, Nihawand, Bahrain, Egypt, Ribdzah, Qum, and Naysabur.

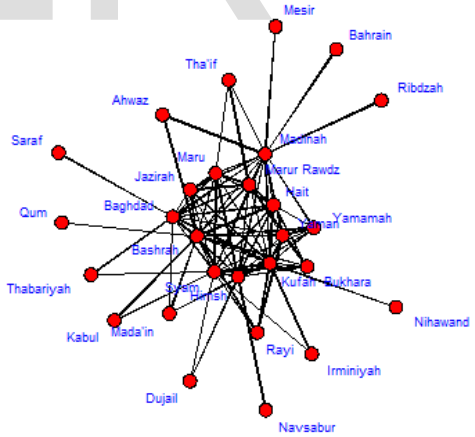

Fig 2. SNA between country life narrators shahih book of Imam Bukhari

Basically SNA formed between country life narrators shows there are few cities as the country life narrator who has a major role (central). Basrah is located in Iraq is a city where life narrators have the greatest value DC. This may indicate that the city is a central city spread of shahih hadith compiled by Imam Bukhari and narrators of the city deal directly with the narrators in other cities. Medina is a city where the Prophet Muhammad migrated had the greatest BC value. This means that the city of Medina as a hub city in the deployment

of the hadith of the other cities. When viewed from the CC, basically the country live narrators have the closeness that is not much different.

Table 3
Centrality country life of narrators shahih hadith book of Imam Bukhari

No	Country Life of Narrator	DC	BC	CC
1	Bashrah	28*)	130.9	20*)
2	Kufah	26	78.5	20*)
3	Madinah	25	134.5*)	19.5
4	Syam	24	105.1	19.5
5	Himsh	20	44.4	16
6	Baghdad	19	53.1	15.5
7	Marur Rawdz	18	27.8	18
8	Maru	15	10.4	16.3
9	Hait	13	1.4	15.7
10	Yaman	13	3.8	16
11	Jazirah	10	0	12.7
12	Yamamah	8	0	14.8
13	Bukhara	7	0	0
14	Mada'in	5	0	12.7
15	Rayi	4	0	0
16	Dujail	3	0	11.8
17	Tha'if	3	0	10.8
18	Ahwaz	2	0	11.5
19	Irminiyah	2	0	11.3
20	Kabul	2	0	11.5
21	Qum	2	0	11.3
22	Ribdzah	2	0	11.2
23	Thabariyah	2	0	10
24	Bahrain	1	0	11.7
25	Mesir	1	0	11.7
26	Saraf	1	0	0
27	Naysabur	1	0	0
28	Nihawand	1	0	0

*)good *centrality*

CHAPTER FIVE
CONCLUSIONS AND RECOMENDATIONS

5.1. Conclusions

Based on this research can be concluded that in narrations hahih hadith compiled by Imam Bukhari is known narrators had a major role (good centrality) that Shu'bah bin Al Hajjaj of the Tabi 'al-Tabi'in who lived in the city of Basrah and Muhammad bin Muslim bin 'Ubaidullah of the Tabi' al-tabi'in who lived in the city of Medina. In addition, the central cities into the country life of the narrators in the hadith narrated in the book of Imam Bukhari hadith is the city of Basrah and Kufah in Iraq and Medina in Saudi Arabia

5.2. Recommendations

This study only used data from a source that is software Ensiklopedi Hadits Kitab 9 Imam published by Lidwa Pusaka 9 which compiles the hadith in the Book of Imam Bukhari hadith as 7008, therefore for further research can combine with the book of Imam Bukhari hadith from other sources

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References

[1] Al-Maliki MA. 2005. Ilmu Ushul Hadits. Yogyakarta:Pustaka Pelajar

[2] Asrukin M. 2010. Artikel Pustakawan:Hadits Sebuah Tinjauan Pustaka.Retreived at March 16th 2016 from library.um.ac.id:http://library.um.ac.id/images/stories/pustakawan/pdfasrukin/HADITS_Sebuah%20Tinjauan%20Pustaka.pdf.

[3] Freeman LC. 1979. Centrality in Social Networks Conceptual Clarification. *Social Networks*, 1: 215-239.

[4] Gonzalez JA, Cascone MH, 2014. Geodesic Distribution In Graph Theory:Kullback-Leiber-Symmetric. *Revista De Matematica:Teoria Y*

[5] Han J, Kamber M. 2006. Data Mining Concepts and Techniques Second Edition. San Francisco: Morgan Kaufmann.

[6] Ismail MS.1988. Kaedah Kesahihan Sanad Hadits (Telaah Kritis dan Tinjauan dengan Pendekatan Ilmu Sejarah). Jakarta: PT Bulan Bintang.

[7] Mukri B. 2005. Kontekstualisasi Hadits Rasulullah (Mengungkap Akar dan Implementasin*ya).*Yogyakarta: Ideal Press.

[8] Opshal T. 2010. Closeness Centrality in Networks with Disconnected Components. Retreived at October 5th 2016 from https://preventviolent extremism.info/sites/ default/files/Closeness%20Centrality%20In%20Networks%20With%20Disconnected%20Components.pdf

[9] Wasserman S, Faust K. 1994. Social Network Analysis: Methods and Application. New York: Cambriidge University Press.


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