A Semantic Network Analysis of Discourses on Net Neutrality on the Web

Abstract

The present study tracked text data, which contained various opinions on net neutrality in cyberspace and academic writings. Net neutrality is a key concept of the Internet Age. Net neutrality is the principle that Internet service providers should allow access to all content and applications equally. On June 2015, a federal appeals court in Washington D.C. rejected a petition for a temporary postponement of the new regulations of the Federal Communications Commission. The verdict made the discussion relevant to net neutrality fiercer among citizens and media in the United States. Policy makers and politicians are affected by the general public, media, and expertise group. The perceptions of net neutrality have an influence on telecommunication policy participants (e.g., the Senate and the House of Representatives in the U.S. and the government). Data were retrieved from Twitter.com (social network service by a U.S. firm), LexisNexis.com (search engine for various documents including news articles, especially of mass media), and Web of Science database (online service for academic society by Thomson Reuters). The authors conducted semantic network analysis for the collected datasets. In addition, the researchers examined the structural pattern of those text data. The present study’s results show that texts related to net neutrality in cyberspace and academic writings have different perspectives in word usage, even emotional dimension.

Keywords: Net Neutrality, Semantic Network Analysis, Federal Communications Commission, Telecommunication Policy, Internet Service Providers (ISPs), Contents Service Providers (CSPs)
1. Introduction

Since the mid-2000’s, debates on net neutrality have continued steadily and diffused across a lot of fields around the world. Net neutrality (NN) is one of the key concepts in the Internet Age. Net neutrality is the principle that internet service providers (ISPs) should allow access to all content and applications equally irrespective of the source without any discrimination including blocking, differential pricing, favoring particular services or products. But the debate on NN is currently fierce and strong. In fact, even as time goes by, the debate is becoming fiercer and has expanded to the global scale. In June 2015, a federal appeals court in Washington D.C. rejected a petition for a temporary postponement of the new regulations of the Federal Communications Commission. In India, Facebook CEO Mark Zuckerberg made ‘war’ with Indian IT companies by engaging in an intense debate regarding NN from 2015 to 2016.

From Google trend service, the authors identify overview of keyword ‘net neutrality’ over time and locality. (Google.com/trends, 11/23/2016) In Figure 1, trend of keyword ‘net neutrality’ was revealed from 2004 to 2016.

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Figure 1 about here

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In Figure 2, three main countries relevant to net neutrality issue were appeared: India, United States, Canada. In 2015, the debate on NN between Facebook and Indian IT companies emerged. They argued NN issue intensively from 2015 to 2016. It caused a lot of interests from the Indian Press. As a result, many text data were created in the Indian Press.
2. Literature Review

2.1. Studies on net neutrality

In the present study, the authors name Supporters for NN as Pro-NN Group and Opponents against NN as Anti-NN Group; the Pro-NN Group in the U.S. argues that NN makes fair competition in the IT market and total social welfare to disappear and decrease. An estimate of welfare loss in the U.S. broadband market is calculated by Economides (2008) as follows:

“We may assume, that a new price discrimination scheme would precipitate a moderate increase in average price of at least 20%. This would imply a deadweight loss ("DWL") of at least 6% of the annual total Internet broadband access bill, using the standard approximate calculation $\text{DWL} = \frac{(AP)(AQ)}{2} = \frac{E(QP)(AP/P)^2}{2}$, where $AP/P$ is the proposed percentage price increase, here 20%, and $e$ is the elasticity of demand, here $e = 3$. OECD puts the number of broadband subscriptions in the United States at almost 60 million. This brings the annual revenue to networks from broadband access to $24$ billion and the estimated direct welfare loss to residential consumers to roughly $144$ million annually” (Economides, 2008, [..] by the authors).

The Anti-NN Group in the U.S. argues that NN disrupts and hinders the IT industry and development of infrastructure relevant to the Internet. In one of the opponent’s papers against NN, Hahn (2006) argues that:
“We believe that mandating net neutrality would be inconsistent with sound economic management of the Internet. A mandate would erode incentives to provide broadband Internet access and could prevent new applications or services from ever being developed. Instead of imposing net neutrality, government should remove artificial regulatory barriers that slow the development of broadband and other information technology services” (Hahn et al., 2006, by the authors).

2.2. Research Questions

RQ 1. In the datasets from three sources, what were the characteristics discovered?

RQ 1-1. In view of word usage frequency, centrality and semantic networks, what were the characteristics found in tweets from Twitter?

RQ 1-2. In view of word usage frequency, centrality and semantic networks, what were the characteristics found in texts from Web of Science?

RQ 1-3. In view of word usage frequency, centrality and semantic networks, what were the characteristics found in text-data from LexisNexis.com?

RQ 2. What are the theoretical and practical implications of the study’s findings?

3. Methodologies

3.1. Data Gathering Method and Data Sources. Three datasets were retrieved from three distinguished and different sources: First, the datasets from Twitter were collected by
‘NodeXL’ (Smith, 2009), which is a parsing and crawling software in cyberspace; second, the data sets of academic articles were constructed from ‘Web of Science’ (WOS) database of Thomson Reuters by topic search; third, text data sets of World Major Publications in English were gathered from “Lexisnexis.com”.

While Twitter is widely used by the general public, Web of Science is specialized for academia. In addition, news and columns of global and local publications in English, which were collected from “lexisnexis.com,” reflect a variety of opinions (from the general public to experts). However, the center of the arguments from media in English inclines towards experts and business leaders in the IT Industry rather than non-experts. Thus this study tracks and compares perceptions and arguments of three different and identified groups.

3.2. Semantic Network Analysis. This study employed semantic network analysis (SNA), which is a measurement method for a variety of text data, both numerically and graphically. ‘NodeXL’ was employed for collecting data on tweets. ‘WORDij’ (Danowski, 2010) was also used to convert text data sets, from LexisNexis.com, Twitter, and Web of Science (WOS), into co-occurrence matrices. ‘WORDij’ is word-pair based software for semantic structure retrieval without any prior categories (Danowski, 2010). The authors adopted UCINET6, which is embedded with NETDRAW, for calculating centrality and visualizing semantic network based on multidimensional scaling (MDS) method.

4. Results

4.1. Timeline of NN issue. In Table 1, the timeline of NN from the press and Twitter is formed over time. It reveals change of core words and topics from 2005 to 2016. In Bush administration, which was conservative and reluctant to market regulation, FCC never regulated disruption of net neutrality (NN). As a result Disputes and arguments relevant to
NN on the Web occurred only in civil sector and academic world. But when Obama administration, which was liberal and progressive, began in 2009, IT industry and opinion leaders demanded NN related regulations for the government. At last, FCC, whose chairman was Julius Genachowski, introduced regulations relevant to NN for the first time in 2010. In response to regulations, Anti-NN groups, especially Internet Service Providers (ISPs) and interest groups, started to oppose by filing suits against the regulations. But Federal Courts dismissed the suits against NN regulations. Between 2010 and 2016, Anti-NN groups’ movement against NN regulations had no success in the U.S. Finally, the Republican Senator Ted Cruz began legislative action to deregulate the federal regulations in 2015.

In 2015, Mark Zuckerberg and Facebook began to get caught into a fierce dispute with NN issues in India. Indian IT industry and opinion leaders criticized that Internet.org, which is a service of Facebook, disrupts net neutrality in the Indian Web ecology.

In Canada and Euro zone, NN regulations and related issues also started to appear on the horizon in the late 2000’s.

4.2. Network of Tweets on Net Neutrality.

In Figure 3, semantic network from Twitter in 2015, there are three clusters identified; first cluster is about ‘Industry and companies relevant to NN’. Second cluster is about ‘Debates in India related to Net Neutrality and Facebook’. Third cluster is about ‘Pro-NN group with
democrats VS Anti NN group with republicans’.

Figure 3 about here

Figure 4 depicts the network of tweets in 2016. Four groups are identified; group A is about Industry and Regulators related to Net Neutrality including Facebook, FCC, EU. Group B is about Hillary Clinton and Presidential Primary issues with Net Neutrality. Group C is about Bernie Sanders and Presidential Primary issues with Net Neutrality. Group D is about Presidential Primary in Philadelphia with NN.

Figure 4 about here

Figure 5 describes semantic network between 2005 and 2008 from LexisNexis.com; first cluster (A) includes ‘Bush administration and Net Neutrality and Regulations issues’; second cluster (B) have ‘Net Neutrality and Regulations in Canada with CRTC’ related topic; third cluster (C) encompasses Industry and Companies issues relevant to Net Neutrality.

Figure 5 about here
Figure 6 is network of NN related issues between 2009 and 2010 from Lexisnexis.com. There exist two clusters; cluster A is ‘Obama Administration and FCC with Net Neutrality issues’; cluster B is ‘Internet industry and companies relevant to Net Neutrality’.

In Figure 7, three groups, which is collected from Lexisnexis.com between 2010 and 2013, are distinguished; first group is about ‘European Commission and Regulations issues upon NN’; second group is about ‘Federal Court and FCC regulations’; third group includes the topic of ‘Internet industry, services, companies relevant to Net Neutrality’.

Figure 8 describes network of NN issues from Lexisnexis.com in 2014; first cluster (A) encompasses ‘Industry, services, companies related to the Web and Net Neutrality’ issues; second cluster (B) includes ‘FCC and Regulations issues with Net Neutrality’.

Figure 8 about here
The network in Figure 9, which was constructed from LexisNexis.com in 2015, three clusters are identified; first cluster is about ‘Industry, services, companies related to the Internet and Net Neutrality’; second cluster is about ‘FCC and Regulations issues with Net Neutrality’; third cluster is about ‘Senator Ted Cruz and Net Neutrality’.

Figure 9 about here

Figure 10 depicts network on keyword ‘net neutrality’ from LexisNexis.com in 2016. There are four groups; first group (A) is about ‘CRTC and Regulations in Canada upon Net Neutrality’; second group (B) is about ‘FCC and Regulations in America’; third group (C) is about ‘Debates related to Facebook in India on Net Neutrality’; fourth group (D) is about ‘Services and Companies including Music and Video Streaming’.

Figure 10 about here

Figure 11 describes semantic network on net neutrality from Web of Science (WOS) between 2006 and 2009. There are four clusters; first cluster is about ‘Market Diversity’; second cluster is about ‘Policy and Regulations related to NN’; third cluster is about ‘Federal Communications Commission’; fourth cluster is about ‘Two-sided market theory’.
The network in Figure 12, which was constructed data from Web of Science between 2010 and 2012. Three groups are distinguished; first group is about ‘Market Failure and competition’; second group is about ‘Differential pricing and telecommunications policy’; third group is about ‘U.S. Congress and FCC’.

Figure 12 about here

Figure 13 describes network on net neutrality from WOS between 2013 and 2015. There are three clusters; first cluster is about ‘Telecommunications Policy and Social welfare’; second cluster encompasses ‘Income Equality and Net Neutrality’ issues; third cluster includes ‘Internet Service Providers (ISPs) and Public Relations’;

Figure 13 about here

5. Discussion and Conclusion
Text data from Twitter (TDT) revealed fierce arguments around NN between 2015 and 2016. In TDT some Twitter users were tend to reveal their political opinions and values with strong and firm. (e.g., teaparty, Presidential Primary in the Democartic party, etc) It shed light on political divide in America from 2015 to 2016. Live and vibrant words were used more frequently in Twitter than the press and academic writings, and some internet slang was used frequently (e.g., tcot, etc). The press (conventional and online media) also participated on Twitter. As result, some tweets with links came from a variety of media, even blogs. In 2016, democratic supporters actively produced a lot of texts on NN relevant to Bernie Sanders and Hillary Clinton. But there are no significant text data related to Trump with NN. Presidential election in 2016 influenced topics and expressions considerably on Twitter.

In text data from Web of Sciences (TDWS), theoretic and conceptual words construct of major components in Semantic Networks (e.g., Two-sided market theory). Data sets divided by three periods show some changes over time.

Text data from Lexisnexi.com (TDLN) began in 2005. Because FCC in Obama Administration passed on NN related regulations in 2010 for the first time, some major words (e.g., Federal Appeals Court and FCC) are more frequently appeared since 2010 than ever before. Many newspapers used more moderate and mild expressions than Twitter.

6. Limitations and Further development

In the future study the authors will need to research new sources of data. (e.g.,

www.reddit.com – one of the most well-known discussion social media in the U.S.) A variety of conventional survey method would be able to merge into the research in the next time. A.I. Research Methods including Deep Learning could be employed in the future study.
References


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Table 1. Timeline of NN related issues from 2005 to 2016
Figure 1. Google Trend of keyword ‘net neutrality’ from 2004 to 2016

Figure 2. Interest on net neutrality based on countries
Figure 3. Semantic Network from Twitter on Net Neutrality in 2015

Network of Tweets on Net Neutrality in 2015

A. Industry and companies relevant to NN
B. Debates in India related to Net Neutrality and Facebook

Figure 4. Semantic Network from Twitter on Net Neutrality in 2016

Network of Tweets on Net Neutrality in 2016

A. Industry and Regulators related to Net Neutrality including Facebook, FCC, EU
D. Presidential Primary in Philadelphia with NN
C. Bernie Sanders and Presidential Primary issues with Net Neutrality
B. Hillary Clinton and Presidential Primary issues with Net Neutrality

C. Pro-NN group with democrats VS Anti NN group with republicans
Figure 5. Semantic Network on Net Neutrality of World Publications from 2005 to 2008

Figure 6. Semantic Network on Net Neutrality of World Publications from 2009 to 2010
Figure 7. Semantic Network on Net Neutrality of World Publications from 2011 to 2013

Figure 8. Semantic Network on Net Neutrality of World Publications in 2014
Figure 9: Semantic Network on Net Neutrality of World Publications in 2015 in English

Figure 10: Semantic Network on Net Neutrality of World Publications in 2016 in English
Figure 11. Semantic Network of Web of Science (WOS) on Net Neutrality from 2006 to 2009

Figure 12. Semantic Network of Web of Science (WOS) on Net Neutrality from 2010 to 2012
Figure 13. Semantic Network of Web of Science (WOS) on Net Neutrality from 2013 to 2015

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